

GOVERNMENT OF INDIA
DEPARTMENT OF ARCHAEOLOGY
CENTRAL ARCHAEOLOGICAL
LIBRARY

CLASS SL 2530

CALL NO 573.60994 How-V

D.G.A. 79.

SEUM

.00.

xas. By Albert S.

abulary obtained from

s. By Zelia Nuttall.

ear Claymont, Dela-

scriptions of 92 Songs,
ded by Francis La Flesche.

es of the music by John Comfort

By C. C. Willoughby.

illustrations in the text. 75 cents.

No. 7. A Penitential Rite of the Ancient Mexicans. By Zelia Nuttall.
1904. 26 pages, 5 plates, and 8 illustrations in the text. 35 cents.

VOLUME II, \$3.50; bound in cloth, \$5.00.

The Fundamental Principles of Old and New World Civilization. By
Zelia Nuttall.

1901. 602 pages, 7 plates, 73 illustrations in the text, and Index.

VOLUME III complete, with Contents and Index, \$3.00; bound in cloth, \$4.50.

No. 1. The Cahokia and Surrounding Mound Groups. By D. I. Bushnell, Jr.
1904. 20 pages, 5 plates, map, and 7 illustrations in the text. 40 cents.

No. 2. Exploration of Mounds, Coahoma County, Mississippi. By Charles Pea-
body.
1904. 44 pages and 17 plates. 75 cents.

No. 3. Inheritance of Digital Malformation in Man. By W. C. Farabee.
1905. 13 pages and 5 plates. 25 cents.

No. 4. The Mandans: A Study of Their Culture, Archaeology, and Language.
By G. F. Will and H. J. Spinden.
1906. 141 pages, 4 maps, 15 plates, and 18 illustrations in the text. \$1.45.

No. 5. Discovery of a Fragment of the Printed Copy of the Work on the Mill-
cayac Language [of Chile] by Luis De Valdivia. By Rudolph R.
Schudler.
1913. 37 pages. 35 cents.

Photographic reproduction of 4 pages of the work, with Bibliographic Notice.

VOLUME IV complete, with Contents, \$3.25; bound in cloth, \$4.75.

No. 1. Representations of Deities of the Maya Manuscripts. By Paul Schellhas.
1904. 47 pages, 1 plate, and 66 illustrations in the text. 35 cents.
A translation.

No. 2. Commentary on the Maya Manuscript in the Royal Public Library of
Dresden. By Ernst Förstemann.
1906. 221 pages, 1 plate, and 10 illustrations in the text. \$1.50. (A few
copies have been interleaved, \$2.35.)
A translation.



AUSTRALIAN TYPES



NEW SOUTH WALES



QUEENSLAND

PAPERS
OF THE
PEABODY MUSEUM OF AMERICAN ARCHAEOLOGY
AND ETHNOLOGY, HARVARD UNIVERSITY

VOL. XVI — No. 1

ANTHROPOMETRY OF THE NATIVES
OF ARNHEM LAND AND THE
AUSTRALIAN RACE PROBLEM

ANALYSIS AND DISCUSSION BY
W. W. HOWELLS

DATA COLLECTED BY
W. L. WARNER

573.60994

How/ War

CAMBRIDGE, MASSACHUSETTS, U.S.A.
PUBLISHED BY THE MUSEUM

1937

COPYRIGHT, 1937
BY THE PRESIDENT AND FELLOWS OF HARVARD COLLEGE

CENTRAL ARCHAEOLOGICAL
LIBRARY, NEW DELHI.

Acc. No. 2530

DATE. 28. 2. 55.

Call No. 573. 60994/How/war.

PRINTED AT THE HARVARD UNIVERSITY PRESS
CAMBRIDGE, MASS., U. S. A.

CONTENTS

INTRODUCTION	vii
GEOGRAPHICAL AREAS OF THE SUBGROUPS	1
Northwest Arnhem Land	1
Victoria River	1
Melville and Bathurst Islands	1
Northeast Arnhem Land	1
Roper River	1
OBSERVATIONS	2
Pigmentation	2
Hair	3
Nasal region	3
Cheek region	3
Chin	3
Ear	3
Teeth	3
COMPARISON OF GEOGRAPHICAL SUBGROUPS	9
Statistical validity of differences	9
Mean differences of subgroups	12
Comparison of measurements and indices of the subgroups	13
Comparison of observations in the subgroups	15
Physical types of subgroups	17
Summary	17
COMPARISON WITH OTHER AUSTRALIAN GROUPS	19
Mean differences	25
Statistical variability	27
Variation in hair form	29
Cranial material	32
Metrical characters of the cranium	36
Head height in South Australia	37
Blond hair in Australians	38
Summary of findings	38
Discussion	39
COMPARISONS WITH OTHER RACIAL GROUPS	40
Melanesia	42
Indonesia	48
Moluccas	52
Lesser Sunda Islands	52
Celebes	53
Borneo	54
Philippine Islands	55
Java	55
Sumatra	56

Malay Peninsula	56
Summary of Indonesia	57
The Pre-Dravidians	58
Asia	59
India	59
Ceylon	64
Indo-China	66
Ainu	66
Summary of Asia	67
The Dravidians	67
DISCUSSION OF THE AUSTRALIAN RACE	67
Theories	67
The Australians an early form of <i>Homo sapiens</i>	71
The Tasmanians	75
The migrations of the Australians	76
Summary	77
APPENDIX I	79
APPENDIX II	81
BIBLIOGRAPHY	89

LIST OF FIGURES

1. Map of Geographical Subgroups Studied	1
2. Map of Comparative Series	26

LIST OF TABLES

1. Skin Color	3
2. Eye Color	3
3. Hair Color	4
4. Hair Form	5
5. Nasal Profile	5
6. Nostrils	5
7. Nasal Wings	5
8. Nasal Septum	6
9. Nasal Septum Inclination	6
10. Cheeks Fullness	6
11. Cheeks Wrinkling	6
12. Chin Prominence	7
13. Ear Lobes	7
14. Ear Lobe Attachment	7
15. Bite	8
16. Teeth Lost	9
17. Teeth Caries	9
18. Teeth Wear	9

19. Differences of Means of Geographical Subgroups with Value in Terms of the Probable Error	10
20. Tabulation by Size of Intergroup Differences in Terms of Their Probable Errors	11
21. Mean Differences between Geographical Subgroups	12
22. Comparison of Means of Subgroups and Total	16
23. Comparison of Total Series with Other Australian Groups	18
24. Mean Differences of Geographical Subgroups from Comparative Series	18
25. Comparison of Northeast and Northwest Subgroups with Other Australian Groups	21
26. Mean Differences in 7 Head Measurements of Northeast and Northwest Subgroups and Comparative Series	24
27. Australian Male Crania — Data of Morant	33
28. Deviation of Territorial Groups from Australian A Series with Value in Terms of the Probable Error — Data of Morant	34
29. Differences of Territorial Groups from Australian A Series Tabulated by Size as Expressed in Terms of the Probable Error — Data of Morant	35
30. Australian Male Crania — Data of Hrdlička	36
31. Australians Compared with Pacific Groups	44
32. Groups of Crania of Melanesia	45
33. Australians Compared with Peoples of Indonesia	50
34. Groups Relating to the "Pre-Dravidians".	58
35. Australians Compared with Peoples of India	60
36. Australians Compared with Chenchus of Farhabad Hills, India	63
37. Australians Compared with Vedda of Ceylon	65
38. Australians Compared with Ainu	66

INTRODUCTION

THE material upon which this study is based was collected by William Lloyd Warner in the course of an investigation of the social organization of the native inhabitants of northern Australia. The following presentation and discussion of the data was done by the undersigned, for which opportunity he wishes to express his profound gratitude to Mr. Warner. The latter describes his obtaining of the material as follows: "The field work for the several series of northern Australian aborigines described in this paper was done in 1927 at Port Darwin and on the Crocodile Islands near Cape Stewart in northeastern Arnhem Land. It was made possible by the generosity of the Rockefeller Foundation and the cooperation of the Australian government and the mission society located in the Crocodile Islands." The author also wishes to pay tribute to the kindness of Professor E. A. Hooton, who has read and criticized the manuscript and whose statistical staff in the Department of Anthropology of Harvard University accomplished the labor of the statistical analysis.

The scientific importance of the Australian aborigines is an anthropological axiom. That Warner's data comprise a valuable accretion to existing knowledge becomes obvious when it is realized how small is the amount of detailed investigation that has been carried out on the physical characteristics of the race. The series includes 239 adult males, mostly from northern Arnhem Land, and is divided into five subgroups, whose geographical distribution is defined in the succeeding section. There is also a smaller group of females which has not been subdivided geographically.

W. W. HOWELLS

GEOGRAPHICAL AREAS OF THE SUBGROUPS¹

Northwest Arnhem Land. The people of northwestern Arnhem Land live on the coast of Timor Sea and inland along the tidal rivers from Daly River in the south to Cobourg Peninsula in the north. The heaviest concentration of individuals measured came from around the Daly River.

Victoria River. The peoples of this subgroup live in southwestern Arnhem Land, largely in the area drained by the Victoria River.

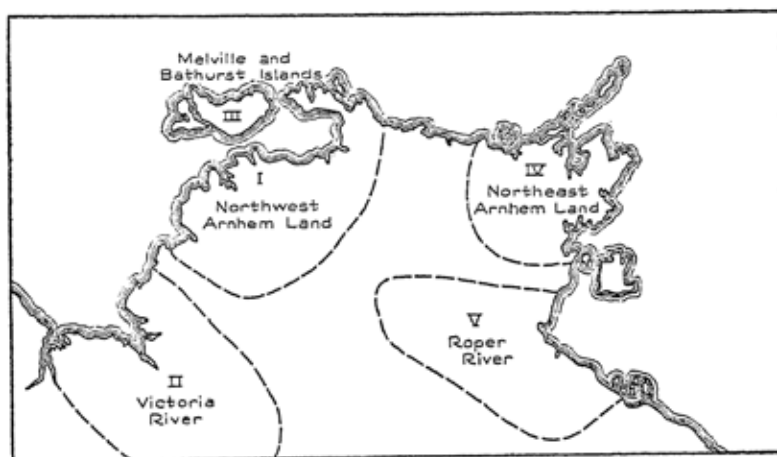


FIGURE 1. MAP OF GEOGRAPHICAL SUBGROUPS STUDIED

Melville and Bathurst Islands. Only the people living on Melville and Bathurst Islands compose this subgroup. They are two coastal islands on the western shore of Arnhem Land.

Northeast Arnhem Land. This area is bounded on the east by the Gulf of Carpentaria, on the north by the Sea of Arafura, on the west by a line running south from Cape Stewart, and on the south by a line running inland from the southern limits of Blue Mud Bay.

Roper River. The peoples included in the Roper group live in the general region of which the northern limits are formed roughly by

¹ The distribution of tribes in northern Australia is given in an article by W. Lloyd Warner, 1933, pp. 63-86. The cultural subareas are also to be found in this account.

2 ANTHROPOMETRY OF THE NATIVES OF ARNHEM LAND

the Rose River and a line drawn directly west from it; the eastern boundary consists of the Gulf of Carpentaria, from that river to the mouth of McArthur River. The southwestern boundaries are the headwaters of the coastal rivers found between the Roper and the McArthur. The western limits extend to the headwaters of the Roper.

For the sake of brevity these groups will generally be designated throughout the paper by the first word in their titles as given above. The Northwest and Northeast groups are considerably larger than the others, the Roper group being so small as to be statistically unavailable. The numbers in each subgroup are: Northwest Arnhem Land, 99; Victoria River, 28; Melville and Bathurst Islands, 28; Northeast Arnhem Land, 77; Roper River, 8.

Besides a full schedule of measurements of each individual, there was recorded a number of detailed morphological observations, presented in the following tables of percentage distributions. Measurements and indices will not be considered abstractly, as the comparative treatment employed renders this superfluous, nor will much attention be given to the series taken as a whole, for reasons which will become apparent. The metrical treatment will consist of an investigation of the interrelations of the subgroups, of physical type in the continent as a whole, and lastly of relationships between the Australians and peoples outside of Australia.

OBSERVATIONS

Morphological observation is subject in a large degree to the personal equation of different workers. Therefore, since these records were not made by the preparator of the report, his comment upon them will be sternly restricted to the most essential points.

Pigmentation. No color standard was used in recording skin pigment, and therefore it cannot be said how light a "light brown" is meant. In the records made on Arunta and South Australians,¹ the lightest color is a "light chocolate," or, checked against Ridgway's standards, not lighter than a fairly rich medium brown. In general, the Australians have a reputation for very deep pigmentation. It is to be noticed that black hair is by no means universal in this region, and varying degrees of light hair have been reported as frequent from many parts of the continent. Why the Northeast peo-

¹ Campbell and Hackett, 1927; Campbell and Lewis, 1926.

ple have such large proportions of the lighter shades of hair and skin is mysterious.

TABLE 1. SKIN COLOR

Male	Light Brown		Dark Brown		Total
	No.	Per cent	No.	Per cent	
Northwest.....	10	10.20	88	89.80	98
Victoria.....	9	32.14	19	67.86	28
Melville.....	1	3.57	27	96.43	28
Northeast.....	44	57.90	32	42.10	76
Roper.....	..	..	8	100.00	8
Total Male.....	64	26.89	174	73.11	238
Total Female.....	24	34.78	45	65.22	69

In every single case throughout the series of 224 males and 68 females, the color of the sclera was recorded as "bloodshot."

Hair. There is no woolly hair and a surprisingly high percentage of straight hair.

Nasal region. Here the tables seem to affirm the usual evidence regarding the primitive form of the Australian nose.

Cheek region. The degrees of fullness of the cheek indicate that the faces are mainly flat-sided.

Chin. This is shown to be clearly receding.

Ear. There is little of a remarkable nature in this organ. The lobe has a tendency to be small and to be attached along its inner margin, rather than pendant.

Teeth. An edge-to-edge bite is the predominating pattern. Loss of teeth, caries and wear have taken a very small toll, considering that the average age for the series is 35 years. In every case in which it was noted (about half the series), eruption of the teeth was complete.

TABLE 2. EYE COLOR

Male	Light Brown		Dark Brown		Black		Total
	No.	Per cent	No.	Per cent	No.	Per cent	
Northwest ..	3	3.12	54	56.25	39	40.62	96
Victoria.....	2	7.69	14	53.85	10	38.46	26
Melville.....	..	..	20	100.00	..	..	20
Northeast....	..	..	60	84.51	11	15.49	71
Roper.....	1	12.50	3	37.50	4	50.00	8
Total Male..	6	2.71	151	68.32	64	28.96	221
Total Female ..	..	..	27	39.71	41	60.29	68

TABLE 3. HAIR COLOR

	Male		Black		Dark Brown		Reddish Brown		Red		Gray, White		Total
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	
Northwest	65	73.03	19	21.35	2	2.25	..	..	..	..	3	3.37	89
Victoria	21	75.00	6	21.43	..	..	..	..	..	..	1	3.57	28
Melville	24	92.31	2	7.69	..	..	..	..	..	..	..	..	26
Northeast	8	10.39	61	79.22	..	..	..	1.30	1	12.50	7	87.50	77
Roper	8	100.00	..	..	..	..	..	..	..	..	..	..	8
Total Male	126	55.26	88	38.60	2	.88	1	.44	11	4.82	..	..	228
Total Female	30	44.78	31	46.27	4	5.97	..	..	2	2.98	..	..	67

TABLE 4. HAIR FORM

Male	Straight		Low Waves		Deep Waves		Frizzly + Curly			Total	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent			
Northwest . . .	32	32.65	41	41.84	24	24.49	1	1.02	98		
Victoria	12	42.86	12	42.86	4	14.29	..	..	28
Melville	4	14.29	12	42.86	10	35.71	2	7.14	28		
Northeast	5	6.49	63	81.82	9	11.69	..	..	77
Roper . . . . .	..	..	5	62.50	3	37.50	..	..	8
Total Male . . .	53	22.18	133	55.65	50	20.92	3	1.26	239		
Total Female	29	42.03	29	42.03	7	10.14	4	5.80	69		
Comparative Data	Straight No.	Per cent	Low Waves No.	Per cent	Medium Waves No.	Per cent	Deep Waves No.	Per cent	Curly No.	Total	
Campbell	1	2.63	18	47.37	6	15.79	10	26.31	3	7.89	38

TABLE 5. NASAL PROFILE

Male	Concave		Straight		Convex		Concavo-convex		Total
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	
Northwest ...	52	54.74	35	36.84	3	3.16	5	5.26	95
Victoria	14	50.00	8	28.57	3	10.71	3	10.71	28
Melville	14	51.85	13	48.15	..	..	..	..	27
Northeast	16	21.33	32	42.67	18	24.00	9	12.00	75
Roper	3	37.50	5	62.50	..	..	..	..	8
Total Male ...	99	42.49	93	39.91	24	7.30	17	10.30	233
Total Female	46	67.65	14	20.59	..	..	8	11.76	68

TABLE 6. NOSTRILS

Male	Antero-posterior		Oblique		Transverse		Total
	No.	Per cent	No.	Per cent	No.	Per cent	
Northwest .	11	11.34	15	15.46	71	73.20	97
Victoria ....	..	..	6	21.43	22	78.57	28
Melville	2	8.00	1	4.00	22	88.00	25
Northeast .	11	14.67	6	8.00	58	77.33	75
Roper	2	25.00	..	..	6	75.00	8
Total Male	26	11.16	28	12.02	179	76.82	233
Total Female	4	5.80	13	18.84	52	75.36	69

6 ANTHROPOMETRY OF THE NATIVES OF ARNHEM LAND

TABLE 7. NASAL WINGS

Male	Medium		Flaring		Total
	No.	Per cent	No.	Per cent	
Northwest	29	30.85	65	69.15	94
Victoria	7	25.93	20	74.07	27
Melville	12	46.15	14	53.85	26
Northeast	35	46.67	40	53.33	75
Roper	3	37.50	5	62.50	8
Total Male	86	37.39	144	62.61	230
Total Female	41	60.29	27	39.71	68

TABLE 8. NASAL SEPTUM

Male	Straight		Concave		Convex		Total
	No.	Per cent	No.	Per cent	No.	Per cent	
Northwest ...	2	2.35	2	2.35	81	95.29	85
Victoria	4	14.29	..	..	24	85.71	28
Melville .....	..	..	..	..	18	100.00	18
Northeast ...	1	1.33	..	..	74	98.67	75
Roper .....	..	..	..	..	6	100.00	6
Total Male ...	7	3.30	2	.94	203	95.75	212
Total Female	2	2.98	..	..	65	97.01	67

TABLE 9. NASAL SEPTUM INCLINATION

Male	Up		Down		Total
	No.	Per cent	No.	Per cent	
Northwest	85	97.70	2	2.30	87
Victoria	25	96.15	1	3.85	26
Melville	23	100.00	..	..	23
Northeast	75	100.00	..	..	75
Roper	6	100.00	..	..	6
Total Male	214	98.62	3	1.38	217
Total Female	63	98.44	1	1.56	64

TABLE 10. CHEEKS FULLNESS

Male	Submedium		Medium		Pronounced		Total
	No.	Per cent	No.	Per cent	No.	Per cent	
Northwest .	82	87.23	12	12.77	..	..	94
Victoria	25	92.59	2	7.41	..	..	27
Melville ...	25	96.15	1	3.85	..	..	26
Northeast .	63	84.00	12	16.00	..	..	75
Roper	6	75.00	2	25.00	..	..	8
Total Male	201	87.39	29	12.61	..	..	230
Total Female	44	64.71	23	33.82	1	1.47	68

TABLE 11. CHEEKS WRINKLING

Male	Absent		Slight, Medium		Pronounced		Total
	No.	Per cent	No.	Per cent	No.	Per cent	
Northwest .	48	52.17	41	44.57	3	3.26	92
Victoria....	12	42.86	16	57.14	..	..	28
Melville....	14	56.00	11	44.00	..	..	25
Northeast .	35	46.05	41	53.95	..	..	76
Roper	3	37.50	5	62.50	..	..	8
Total Male	112	48.91	114	49.78	3	1.31	229
Total Female	44	66.67	22	33.33	..	..	66

TABLE 12. CHIN PROMINENCE

Male	Absent		Submedium		Medium		Total
	No.	Per cent	No.	Per cent	No.	Per cent	
Northwest ..	4	4.12	85	87.63	8	8.25	97
Victoria.....	..	..	24	85.71	4	14.29	28
Melville.....	..	..	23	82.14	5	17.86	28
Northeast....	3	3.90	50	64.94	24	31.17	77
Roper .....	..	..	8	100.00	..	..	8
Total Male..	7	2.94	190	79.83	41	17.23	238
Total Female ..	..	..	61	88.41	8	11.59	69

TABLE 13. EAR LOBES

Male	Submedium		Medium		Pronounced		Total
	No.	Per cent	No.	Per cent	No.	Per cent	
Northwest .	28	69.79	67	29.17	1	1.04	96
Victoria....	7	25.00	21	75.00	..	..	28
Melville....	6	21.43	22	78.57	..	..	28
Northeast .	31	40.26	45	58.44	1	1.30	77
Roper .....	..	..	8	100.00	..	..	8
Total Male	72	30.38	163	68.78	2	.84	237
Total Female	23	33.33	46	66.67	..	..	69

TABLE 14. EAR LOBE ATTACHMENT

Male	Attached		Free		Total
	No.	Per cent	No.	Per cent	
Northwest.....	44	44.90	54	55.10	98
Victoria.....	7	25.93	20	74.07	27
Melville.....	13	46.43	15	53.57	28
Northeast.....	45	58.44	32	41.56	77
Roper.....	3	37.50	5	62.50	8
Total Male.....	112	47.06	126	52.94	238
Total Female.....	36	52.17	33	47.83	69

TABLE 15. BITE

Male	Under		Edge-to-Edge		Slight Over		Marked Over		Total
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	
Northwest	5	6.49	58	75.32	11	14.29	3	3.90	77
Victoria	1	5.26	15	78.95	2	10.53	1	5.26	19
Melville	2	7.69	17	65.38	2	7.69	5	19.23	26
Northeast	3	3.90	60	77.92	10	12.99	4	5.19	77
Roper .....	..	..	5	83.33	1	16.67	..	..	6
Total Male	11	5.37	155	75.61	26	12.68	13	6.34	205
Total Female .....	..	..	39	70.91	11	20.00	5	9.09	55

TABLE 16. TEETH LOST

Male	None		Few		Many		Total
	No.	Per cent	No.	Per cent	No.	Per cent	
Northwest .	38	59.38	21	32.81	5	7.81	64
Victoria....	15	71.43	4	19.05	2	9.52	21
Melville....	20	90.91	2	9.09	..	..	22
Northeast .	51	69.86	19	26.03	3	4.11	73
Roper	1	25.00	2	50.00	1	25.00	4
Total Male	125	67.93	48	26.09	11	5.98	184
Total Female	37	71.15	11	21.15	4	7.69	52

TABLE 17. TEETH CARIES

Male	None		Few		Many		Total
	No.	Per cent	No.	Per cent	No.	Per cent	
Northwest .	44	61.97	9	12.68	18	25.35	71
Victoria....	14	73.68	1	5.26	4	21.05	19
Melville....	23	92.00	2	8.00	..	..	25
Northeast .	56	73.68	13	17.10	7	9.21	76
Roper	2	50.00	2	50.00	..	..	4
Total Male	139	71.28	27	13.85	29	14.87	195
Total Female	43	79.63	6	11.11	5	9.26	54

TABLE 18. TEETH WEAR

Male	None		Slight, Medium		Pronounced		Total
	No.	Per cent	No.	Per cent	No.	Per cent	
Northwest ..	35	47.30	34	45.95	5	6.76	74
Victoria	15	71.43	5	23.81	1	4.76	21
Melville.....	19	82.61	4	17.39	..	..	23
Northeast ..	36	48.00	36	48.00	3	4.00	75
Roper	1	25.00	3	75.00	..	..	4
Total Male .	106	53.81	82	41.62	9	4.57	197
Total Female	34	57.63	20	33.90	5	8.47	59

COMPARISON OF GEOGRAPHICAL SUBGROUPS

Statistical Validity of Differences. In comparing the subgroups with one another, the necessary first step is to find out whether such differences as obtain are significant in a statistical sense, or are merely the product of sampling. In general, any given metrical difference between two groups is considered significant if it is three times the size of its own probable error,¹ since the chances of such an occurrence in random samples of the same population are approximately one in twenty-five. The expectation of a difference

¹ PE ($M_1 - M_2$) = $\sqrt{(PEM_1)^2 + (PEM_2)^2}$.

TABLE 19. DIFFERENCES OF MEANS OF GEOGRAPHICAL SUBGROUPS WITH VALUE IN TERMS OF PROBABLE ERROR

	Northwest-Victoria		Northwest-Northeast		Northwest-Melville		Victoria-Northeast		Victoria-Melville		Melville-Northeast	
	Diff.	x p.e.	Diff.	x p.e.	Diff.	x p.e.	Diff.	x p.e.	Diff.	x p.e.	Diff.	x p.e.
Height	33	0.38	2.64	4.47	2.79	3.99	2.31	2.60	2.46	2.54	.15	0.21
Weight	4.50	1.93	1.60	0.54	4.10	1.93	2.90	0.83	.40	0.14	2.50	0.74
Biacromial diameter	1.82	2.48	.50	2.38	1.48	5.10	1.32	4.13	.66	1.74	1.98	7.33
Sitting height	10	0.20	.01	0.03	1.06	2.41	.09	0.17	.96	1.60	1.05	2.33
Chest depth	1.36	5.23	.24	1.71	.44	2.44	1.12	4.67	.92	3.41	1.20	1.25
Chest breadth	.99	3.30	1.05	5.25	.45	1.88	.06	.21	1.44	4.65	1.50	6.82
Total head length	3.76	2.96	5.88	7.17	5.04	4.71	2.12	1.63	1.28	.87	.84	.76
Hand length	1.68	2.27	3.96	7.62	1.68	2.71	2.28	3.08	.00	.00	2.28	3.68
Hand breadth	1.44	1.95	2.58	5.73	1.44	2.29	1.14	1.52	.00	.00	1.14	1.78
Head length	.18	.19	1.17	1.80	3.93	3.97	1.35	1.57	4.11	3.57	2.76	3.00
Head breadth	.87	1.21	3.99	5.05	2.01	3.14	4.86	5.12	2.88	3.47	1.98	2.22
Head height	.24	.27	6.06	10.63	.36	.58	5.82	6.54	.12	.13	5.70	8.77
Head circumference	6.60	3.24	1.80	1.12	8.76	3.52	8.40	4.18	2.16	.78	10.76	4.29
Minimum frontal diameter	.28	.35	.16	.33	.44	.59	.12	.15	.72	.75	.60	.81
Bizygomatic diameter	1.85	2.68	.50	.96	2.95	3.88	1.35	1.85	4.80	5.22	3.45	4.31
Bigonial diameter	3.60	3.67	1.80	3.16	1.08	1.30	1.80	1.82	4.68	4.03	2.88	3.43
Total face height	.60	.63	3.25	4.85	2.85	2.79	3.85	4.14	3.40	2.81	.40	.40
Upper face height	.90	1.29	2.45	4.90	3.15	4.77	3.35	4.72	4.05	4.88	.70	1.04
Nose height	.32	.46	2.00	4.76	3.20	5.52	1.68	2.51	2.88	3.69	1.20	2.18
Nose breadth	.24	.39	.60	1.62	.45	.82	.36	.58	.21	.28	.15	.27
Ear length	1.16	1.63	.92	2.04	1.56	2.33	.24	.35	.40	.47	.64	.98
Ear breadth	.48	1.17	.18	.69	.15	.44	.30	.71	.33	.70	.03	.09
Relative shoulder breadth	.04	.19	.56	5.09	.82	7.45	.52	2.60	.86	4.30	1.38	15.33
Relative sitting height	32	1.33	32	1.78	.68	2.96	.64	2.56	1.00	3.45	.36	1.50
Hand index	.30	.79	.26	1.24	.52	2.26	.56	1.47	.22	.56	.78	3.55
Cephalic index	.54	1.06	2.61	8.70	2.46	6.83	3.15	6.06	3.00	5.36	.15	.41
Length-height index	.06	.11	3.78	11.12	1.77	4.54	3.84	6.98	1.83	3.16	2.01	5.03
Breadth-height index	.33	.48	1.47	3.34	1.56	3.12	1.14	1.73	1.89	2.70	3.03	6.59
Fronto-parietal index	.96	2.23	1.50	3.57	1.59	3.61	2.46	4.92	2.55	4.90	.09	.18
Cephalo-facial index	2.04	3.29	2.88	7.02	3.39	4.71	4.92	7.45	5.43	6.17	.51	.68
Zygo-frontal index	.20	.34	.20	.67	1.08	2.35	.00	.00	1.28	1.94	1.28	2.84
Fronto-gonial index	3.85	4.43	1.85	2.85	.10	.12	2.00	2.25	3.95	3.99	1.95	2.41
Zygo-gonial index	1.74	3.35	1.11	2.71	.00	.00	.63	1.15	1.74	2.90	1.11	2.22
Facial index	1.32	1.88	1.50	3.06	3.32	4.81	2.82	3.97	4.64	5.40	1.82	2.60
Upper facial index	1.95	3.42	1.74	4.46	2.58	6.14	3.69	6.47	4.53	7.68	.84	2.05
Nasal index	.48	.39	5.84	5.73	5.52	3.52	2.46	4.92	2.55	4.90	.09	.18
Ear index	.44	.49	1.07	1.07	1.44	1.82	.04	.04	1.00	.90	.96	1.23

four times its probable error is only seven in a thousand comparisons.

In Table 19 are given all the intergroup differences in measurements and indices, each difference being accompanied, not by its probable error, but by the quotient of itself divided by its probable error. (The Roper River group is omitted, being too small for statistical manipulation.) Thus, it is to be seen that the difference between the Northwest and Northeast groups in the cephalic index is 2.61 units, which is 8.7 times its probable error. In spite of the small size of the difference, the chances are over a hundred million to one that it is due to some factor other than random sampling.

An examination of Table 20 shows, in the first place, that it would be difficult to say whether the Northwest and Victoria groups are separable on this basis from each other. In a few random measurements the differences are statistically significant, as in several facial indices, which, it should be noted, are more or less related to one another (cephalo-facial, fronto-gonial, zygo-gonial and upper facial). Otherwise the majority of differences are such as the process of sampling might induce. Both the Northwest and Victoria groups, however, differ significantly from the Melville and Northeast groups in so many measurements and indices that such an explanation is out of the question. The Melville and Northeast groups likewise differ in a large number of measurements, though in only a few indices. The total difference may perhaps be considered to be smaller in this case, since it will be seen that it is partly induced by correlation; the Melville people are larger than the Northeast group in many of their measurements, which is a single general character.

In Table 20, the differences in terms of the probable error have been tabulated in simple form according to size. These distributions are of no definite significance by themselves, but merely summarize Table 19. The figures listed opposite "probability" are the distribution expected to arise from an equal number of samplings in a single character, and not, as in this case, in different characters.

The indices, perhaps due to their smaller variability, exhibit in almost all cases more significant differences than the measurements. The only individual characters which do not seem to differ significantly among the groups are weight, sitting height, minimum frontal breadth, nasal breadth, the length, breadth, and index of the

12 ANTHROPOMETRY OF THE NATIVES OF ARNHEM LAND

ear, and perhaps the zygo-frontal index. It may be that some of these are characters of little use in racial diagnosis, or that they exhibit, in themselves, too little or too great variability to show clear differences between such closely related groups.

TABLE 20. TABULATION BY SIZE OF INTERGROUP DIFFERENCES IN TERMS OF THEIR PROBABLE ERRORS

	0-1	1-2	2-3	3-4	4-x	Mean
22 measurements						
Probability	11	7.10	2.95	0.79	0.15	1.23
Northwest-Victoria . . .	8	6	4	3	1	1.72
Northwest-Northeast . .	5	4	2	1	10	3.49
Northwest-Melville . . .	4	3	6	5	4	2.78
Victoria-Northeast . . .	6	6	2	1	7	2.41
Victoria-Melville	10	2	2	4	4	2.08
Melville-Northeast . . .	8	3	4	2	5	2.58
15 indices						
Probability	7.50	4.84	2.01	0.54	0.10	1.23
Northwest-Victoria . . .	7	3	1	3	1	1.59
Northwest-Northeast . .	1	3	2	3	6	4.16
Northwest-Melville . . .	2	1	3	3	6	3.62
Victoria-Northeast . . .	2	3	3	1	6	3.45
Victoria-Melville	2	1	3	3	6	3.75
Melville-Northeast . . .	4	2	5	1	3	3.12

TABLE 21. MEAN DIFFERENCES BETWEEN GEOGRAPHICAL SUBGROUPS

	22 measurements	15 indices	10 head measurements	11 head indices
Northwest-Victoria	1.47	.97	.91	1.22
Northwest-Northeast	1.97	1.74	2.20	2.23
Northwest-Melville	2.24	1.79	2.04	2.12
Northwest-Roper	2.32	2.02	2.14	2.64
Victoria-Northeast	2.13	2.12	2.45	2.73
Victoria-Melville	1.77	2.60	2.78	3.26
Victoria-Roper	2.35	2.14	2.88	2.81
Northeast-Melville	1.94	1.11	1.88	1.19
Northeast-Roper	3.16	1.53	3.28	1.96
Melville-Roper	1.58	1.52	1.48	1.88

Mean Differences of Subgroups. The probable error furnishes us with the statistical, but not the absolute, difference between subgroups; to approximate the latter we calculate the mean differences, given in Table 21, for each pair of groups. This is supplied for the measurements and indices of the head, as well as for all the characters together. Fortunately the Roper River group may be included in this type of treatment.

The likeness between the Northwest and Victoria groups is re-

affirmed; they exhibit a strong affinity for each other, as opposed to the remaining divisions. These latter also form a group within which the mean differences, with one exception, are low, particularly in indices, so that the major fact of importance remains the separation of these three groups from the first two. If, in the head measurements, head height and bigonial width were omitted, the lines would be more strictly drawn, as each of these characters is inexplicably aberrant in one group. Likewise, if only five indices are employed, the cephalic, cephalo-facial, facial, upper facial and nasal, these mean differences are obtained:

North-west-Victoria	North-west-east	North-west-Melville	North-west-Roper	Victoria-North-east	Victoria-Melville	Victoria-Roper	North-east-Melville	North-east-Roper	Melville-Roper
1.27	2.91	3.45	2.87	3.99	4.53	3.94	.73	1.56	1.57

The comparative lowness of the first figure and of the last three again emphasizes the same line of cleavage. The placing of the remaining groups is not so simple. The principal common characteristic of the Melville, the Northeast, and the Roper groups is their unlikeness to the other two. Beyond this, the impression is that in a general way the Melville and Bathurst group stands between the Northeast and Roper people, with affinities in both directions. All three of these are about equally near to the Northwest group and equally remote from the Victoria group. The affinities and disparities of each of the divisions may be summed up in the following manner. From the Victoria River sample, the Northwest group is hardly significantly different, though all the others are far removed. The Northwest group is closest to the Victoria group and only moderately distant from the other three. Melville and Bathurst Islands are most nearly approached by Roper and Northeast, less nearly by the Northwest sample and not at all by that from the Victoria River. Both the Roper and Northeast groups have these affinities in common: nearest, Melville and Bathurst; next, Northwest; furthest, Victoria River; furthermore, though they differ strongly from each other in the measurements, their mutual difference is only moderate in the indices.

Comparison of Measurements and Indices of the Subgroups. Going into particulars, let us inspect the actual means of the subgroups, to find out in what bodily characteristics the above relationships are borne out.

14 ANTHROPOMETRY OF THE NATIVES OF ARNHEM LAND

In stature, shoulder breadth and relative shoulder breadth, sitting height and relative sitting height, there is a contrast between Melville and Bathurst Islands on one hand and the Northwest and Victoria groups on the other. The latter are two or three centimeters taller than all the other groups, though the Melville group is the greatest in shoulder breadth and trunk length. Thus, Melville and Bathurst have the greatest relative shoulder breadth, Northeast Arnhem Land having the least; and the greatest relative sitting height, the Northwest and Victoria having the least.

Head length is in inverse ratio to head breadth, the Northwest-Victoria people having indices of about 73, the others, 70. There is little variety in head height, except for the very low-headed Northeast group. The length-height and breadth-height indices are therefore controlled by the length and breadth, except in the case of the Northeast group. This group has the smallest heads, these being lowest, narrowest, and comparatively short.

Differences in the forehead breadth are trivial, except for the Roper group, which is much higher than the others. The fronto-parietal indices are thus mere reflections of the head-breadths.

Victoria, Northwest and Northeast are the groups with the narrowest faces; since the first two have also the broadest heads, their cephalo-facial index is the lowest. The zygo-frontal index illustrates only the fact that the Roper group has the broadest foreheads, and Melville and Bathurst the broadest faces.

The face and the upper face are longest for the Northwest-Victoria groups and Roper River, and shortest for Melville and Bathurst and the Northeast groups. Since the face width takes the opposite trend, the differences are exaggerated in the face indices.

The Northwest-Victoria groups have the longest and narrowest noses (if any difference can be said to exist in nose breadth).

In the mandibular breadth the Northwest and Victoria groups separate, the former being higher, exceeding the Northeast group, and approaching the still higher Roper and Melville and Bathurst divisions. A similar situation exists in the fronto-gonial index, though the wide forehead of the Roper group, in spite of the wide jaw, lowers the index to the level of the Victoria River group. Little can be said of the zygo-gonial index, though the Northwest-Victoria groups are still parted, the latter being the highest, together with Melville and Bathurst Islands.

The differences in the ear measurements are so small as to be unworthy of comment. In hand size, the order is the same for length and breadth, Northeast smallest and Northwest and Roper largest. The head circumference of the Northwest and Northeast groups is distinctly below that of the others.

The facts are best summed up by describing each group in terms of the composite of all of them, and generally disregarding such differences as are statistically significant but diagnostically unimportant.

The Northwest and Victoria River samples may be considered together. The people of this group are taller, with relatively longer legs, than the rest. Though the head is approximately the same size, it is distinctly less dolichocephalic, and the length-height index is the highest, due to the lesser length. The face is narrower, particularly in relation to the broad head, and it is long, both absolutely and in the facial index. The noses are longer, and thus somewhat less platyrrhine. In the bigonial breadth, there is a division, the Victoria River group having the narrowest jaws of all, although the Northwest mean is not as high as that of the Melville and Roper groups.

It is understood that the Melville and Bathurst, Roper, and Northeast groups share generally the opposite form of a character to that by which the Northwest and Victoria groups are distinguished from them; none of them is consistently further away or nearer the two latter than are the others.

The Melville and Bathurst sample has as its particular body features the greatest shoulder breadth and trunk length, without the greatest stature. With the Roper group it shares the longest heads and widest faces, and with the Northeast group the shortest faces; therefore the facial index is the most euryprosopic of all. Also with the Northeast group, the nose is most platyrrhine and the lower jaw is relatively and absolutely wide.

The Northeast division has in most cases the smallest absolute measurements, and this furnishes its contrast with the Roper group which in a general way has the largest; this contrast is not found in the indices. In other words there is a demarcation between the two in size but not necessarily in form. It should be remembered again that the Roper group is very small, and one large individual might be responsible for all these effects. The Roper group has the long-

TABLE 22. COMPARISON OF MEANS OF SUBGROUPS AND TOTAL

	Victoria			Melville			Northeast			Roper			Total		
	Northwest														
Height	169.62±.40	169.29±.78	166.83±.58	166.98±.43	166.50	168.30±.26									
Weight	121.40±1.02	125.90±2.09	125.50±1.86	123.00±2.80	130.50	123.30±.58									
Biacromial diameter	35.14±.16	35.96±.29	36.62±.24	34.64±.13	36.50	35.60±.09									
Sitting height	82.02±.22	82.12±.46	83.08±.38	82.03±.24	82.00	82.57±.14									
Chest depth	19.08±.12	17.72±.23	18.64±.14	18.84±.08	19.00	18.80±.07									
Chest breadth	24.45±.16	23.46±.25	24.90±.18	23.40±.12	24.36	24.06±.09									
Total hand length	188.70±.56	184.94±1.15	183.66±.92	182.82±.61	186.62	185.82±.37									
Hand length	106.56±.37	104.88±.64	104.88±.50	102.60±.37	106.86	104.91±.23									
Hand breadth	82.48±.31	81.04±.67	81.04±.55	79.90±.33	83.86	81.37±.20									
Head length	188.97±.53	188.79±.75	192.90±.84	190.14±.37	193.86	189.93±.27									
Head breadth	138.01±.35	138.88±.63	136.00±.54	134.02±.71	137.14	136.54±.23									
Head height	126.36±.38	126.12±.79	126.00±.49	120.30±.42	127.71	124.29±.27									
Head circumference	530.90±1.17	537.50±1.67	539.66±2.20	529.10±1.11	542.06	532.46±.71									
Minimum frontal diameter	104.78±.35	104.50±.71	105.22±.65	104.62±.35	108.78	104.82±.22									
Bizygomatic diameter	139.75±.33	137.90±.61	142.70±.69	139.25±.40	143.25	139.85±.23									
Bigonial diameter	105.26±.40	101.66±.90	106.34±.73	103.46±.41	107.50	104.46±.25									
Total face height	113.05±.49	113.65±.81	110.20±.90	109.80±.45	113.25	111.70±.30									
Upper face height	64.60±.34	65.50±.61	61.45±.57	62.15±.36	63.90	63.50±.22									
Nose height	48.54±.32	48.22±.61	45.34±.48	46.54±.27	45.50	47.38±.19									
Nose breadth	46.88±.26	47.12±.56	47.33±.48	47.48±.26	47.36	47.15±.16									
Ear length	64.22±.34	63.06±.62	62.66±.58	63.30±.29	64.50	63.62±.20									
Ear breadth	35.94±.18	35.46±.37	35.79±.29	35.76±.19	35.25	35.76±.11									
Relative shoulder breadth	21.26±.09	21.22±.19	22.08±.07	20.70±.06	21.50	21.18±.05									
Relative sitting height	48.96±.12	48.64±.21	49.64±.20	49.28±.13	49.36	49.12±.07									
Hand index	43.84±.16	44.14±.35	44.36±.17	43.58±.14	44.00	43.86±.09									
Cephalic index	72.96±.20	73.50±.47	70.50±.30	70.35±.22	70.14	71.82±.14									
Length-height index	67.01±.23	67.07±.49	65.24±.31	63.23±.25	66.29	65.51±.16									
Breadth-height index	91.25±.34	90.92±.60	92.81±.37	89.78±.28	93.29	90.95±.20									
Fronto-parietal index	75.97±.24	75.01±.36	77.56±.37	77.47±.34	78.58	76.63±.17									
Cephalo-facial index	95.15±.25	93.11±.57	98.54±.67	98.03±.33	100.64	96.44±.21									
Zygo-frontal index	75.02±.23	75.22±.53	73.94±.40	75.22±.20	79.22	75.02±.15									
Fronto-gonial index	100.85±.44	97.00±.75	100.95±.65	99.00±.48	97.00	99.80±.28									
Zygo-gonial index	75.37±.27	73.63±.45	75.37±.39	74.26±.31	74.14	74.77±.17									
Facial index	80.98±.35	82.30±.61	77.66±.60	79.48±.36	78.50	80.14±.22									
Upper facial index	46.37±.28	48.32±.50	43.79±.31	44.63±.27	46.25	45.71±.17									
Nasal index	98.06±.66	98.54±1.03	103.88±1.43	103.90±.78	101.50	100.74±.45									
Ear index	56.06±.33	56.50±.84	57.50±.72	56.54±.31	56.50	56.46±.21									

est heads, while the Northeast group has the narrowest and almost the shortest; the index of both is 70. The Northeast group has the lowest, the Roper the highest heads. The foreheads, zygomatic arches, and mandibles of the Northeast sample are among the narrowest while those of the Roper group are the broadest. In the cephalic and facial indices they are almost the same; in most of the other indices the Northeast group approaches the general average, while the Roper group tends to be extreme; it is the Northeast group, however, which has the most platyrrhine noses of all.

Comparison of Observations in the Subgroups. The non-metrical characters furnish some differences between the groups, although they cannot be relied on as fully as the means of the measurements, which have the virtue of being single figures, statistically controlled, instead of a table of percentages. Moreover, the Roper River group, being so small, must be disregarded as far as percentage distributions go.

The Northwest group is, along with the Victoria River group, possessed of the greatest amount of straight hair. In hair color, the Northeast sample is distinct, being mainly dark brown, while the others are almost entirely black; the same is true for skin color, while both Northeast and Melville and Bathurst Islands have lighter eyes.

In the Northeast group we find the most convex noses, while the most flaring wings are those of the Victoria and Northwest people.

Physical Type of Subgroups. The Northwest and Victoria groups are, metrically, taller and longer-legged, less dolichocephalic though with relatively longer faces and noses. Their noses are at the same time more flaring. Their hair is more often straight.

The Melville and Bathurst people have the largest trunks, are very dolichocephalic, euryprosopic, and platyrrhine. They also have the lightest eyes.

The Northeast group seems somewhat stunted when compared to the others, particularly in head measures. It, too, is very dolichocephalic and platyrrhine, though the facial index is medium for Australians. The group has also relatively light eyes, and the most projecting noses and chins.

The Roper group is distinguished by large heads and faces. The head is long and absolutely dolichocephalic and the face, at the forehead, the zygomata and the gonial angles, is absolutely and rela-

18 ANTHROPOMETRY OF THE NATIVES OF ARNHEM LAND

TABLE 23. COMPARISON OF TOTAL SERIES WITH OTHER AUSTRALIAN GROUPS

Number	North Australia		Central Australia
	Warner 239	Burston 62	Campbell and Hackett 42
Head length.....	189.93	192.69	192.48
Head breadth.....	136.54	140.20	143.20
Head height.....	124.29	135.42 (?)	127.29
Minimum frontal diameter.....	104.82	112.30 (?)	102.50
Bizygomatic diameter.....	139.85	139.35	141.05
Bigonial diameter.....	104.46	105.70	102.38
Total face height.....	111.70	117.00	114.55
Upper face height.....	63.50	66.20	..
Nose height.....	47.38	48.86	53.14
Nose breadth.....	47.15	46.28	50.06
Cephalic index.....	71.82	72.81	74.28
Length-height index.....	65.51	69.98 (?)	66.14
Breadth-height index.....	90.95	96.32 (?)	89.00
Fronto-parietal index.....	76.63	80.11 (?)	71.50
Cephalo-facial index.....	96.44	93.44	92.51
Zygo-frontal index.....	75.02	80.66 (?)	72.74
Fronto-gonial index.....	99.80	94.25 (?)	99.55
Zygo-gonial index.....	74.77	75.58	72.43
Facial index.....	80.14	84.06	81.26
Upper facial index.....	45.71	47.72	..
Nasal index.....	100.74	95.82	94.82

TABLE 24. MEAN DIFFERENCES OF GEOGRAPHICAL SUB-GROUPS FROM COMPARATIVE SERIES

	Central Australia—Campbell and Hackett	
	9 Head Measurements ¹	10 Head Indices ²
Total.....	3.26	2.60
Northwest.....	2.82	2.16
Victoria.....	2.65	1.87
Melville.....	3.57	3.85
Northeast.....	4.16	3.48
Roper.....	3.68	4.40

	North Australia—Burston	
	8 Head Measurements ³	6 Head Indices ⁴
Total.....	2.31	2.61
Northwest.....	1.65	1.46
Victoria.....	2.03	1.34
Melville.....	3.06	4.28
Northeast.....	3.23	4.02
Roper.....	2.56	4.00

Total	Warner-Burston	Warner-Campbell	Burston-Campbell
7 Measurements ⁵	2.26	3.43	2.68
5 Indices ⁶	2.73	3.15	1.87

¹ Does not include upper face height.² Does not include upper facial index.³ Does not include minimum frontal or head height.⁴ Does not include indices involving head height or minimum frontal.⁵ Head length and breadth, face height, bizygomatic, nose height and breadth; bigonial.⁶ Cephalic, cephalo-facial, facial, nasal, zygo-gonial.

tively broad; it is also comparatively long, though the index is medium, as is the nasal index.

Summary. It seems possible to form two groups, divided by a line running northwest and southeast; the northern division comprising the people of the Melville, Northeast and Roper groups, the southern group containing the Northwest and Victoria people. The latter are taller than those of the first group, with shorter and wider heads and a distinctly higher cephalic index. The face in this portion is both narrower and longer, and the nose is longer and narrower, producing in both of the derived indices a definite difference. The Northwest people appear nearer than those of Victoria River to the groups of the northern division physically as well as geographically.

COMPARISON WITH OTHER AUSTRALIAN GROUPS

For detailed comparative purposes there are only two other series of adequate size. One, published by R. Burston, is drawn from North Australia and coincides geographically with Warner's in a general way. It is unknown which areas are best represented, but the following note, in a personal communication from Warner, is edifying: "According to reliable information, Burston measured his material in the town of Port Darwin. It is highly likely that most of his natives came from western Arnhem Land, and it is certain that few if any came from northeastern Arnhem Land, and very few from the Roper River region." In these circumstances one would expect this series to exhibit a resemblance particularly to the subgroup of Warner's series from Northwest Arnhem Land. The other sample, obtained by Campbell and Hackett, is from Central Australia and northern South Australia, and is almost entirely of the Arunta tribe.¹

We may compare these two groups with the present material by finding their mean differences in selected characters. Certain measurements, such as those taken by Burston on the forehead and the head height, were obviously not made according to standard technique and must be discarded, along with the indices derived from them. Other discrepancies may be due in part to a personal equation among the three observers, but in the calculations of the mean differences these should to a large extent cancel each other.

¹ The means for these two series were calculated from the published material by the statistical staff of the Division of Anthropology.

Since these two series obviously differ in many ways from Warner's total series, the question arises whether such differences are due in part to a likeness to any of the subgroups: that is, whether they resemble any of the subgroups more than the total group and more than the other subgroups.

For both the Central Australian and the Burston series the average differences of certain means from those of each of the subgroups, as well as the total group, have been calculated. This process was carried out only on the measurements and indices of the head, as it would be inadvisable to include less significant or highly variable characters such as weight, etcetera. Furthermore, the figures applying to the Burston series are not comparable with those for the Campbell series, since each furnishes some measurements not present in the other.

There are also given the mutual average differences between all three major series for head measurements and indices common to all. These indicate that the present series is more closely resembled by that of Burston than by Campbell's.

In the preceding section, it was found that a demarcation among Warner's series existed between the Northwest and Victoria groups on one hand and the Melville, Northeast, and Roper groups on the other. The figures indicate that both comparative series here dealt with resemble the Northwest and Victoria groups far more closely than the others; there is a gratifying unanimity in this direction. Neither the Northwest nor Victoria River groups seem favored in this respect, however. Also, the differences are less for the indices than for the measurements, which is not true in the case of the other three groups, and which seems to indicate that the general form of the head and its features definitely exhibits a likeness between the Northwest-Victoria group and the two comparative series. The mean difference of our total series from the latter two is intermediate, which confirms the above findings.

Going into particulars, we find that both the Campbell and Burston groups are less dolichocephalic, euryprosopic, and platyrrhine than our total series, in which they resemble the Northwest-Victoria River division. This is true of several other indices and a number of measurements, though in stature there is a discrepancy, Campbell's people being shorter, and Burston's taller, than any of our subgroups.

TABLE 25. COMPARISON OF NORTHEAST AND NORTHWEST SUBGROUPS WITH OTHER AUSTRALIAN GROUPS

	1 Northeast (Warner)	2 Northwest (Warner)	3 North Australia (Burston)	4 North and Central Australia (Spencer and Gillen)	5 Central Australia- Arunta (Spencer and Gillen)
Number	77	99	62	21	20
Stature	166.98	169.62	170.52	172.52	166.30
Sitting height	82.03	82.02	83.30	.....	.....
Biacromial diameter	34.64	35.14	35.72	.....	.....
Head length	190.14	188.97	192.69	192.86	189.65
Head breadth	134.02	138.01	140.20	138.71	141.80
Head height	120.30	126.36	135.42	.....	.....
Minimum frontal diameter	104.62	104.78	112.30	.....	107.21
Bizygomatic diameter	139.25	139.75	139.35	134.81	142.05
Bigonial diameter	103.46	105.26	105.70	105.67	98.45
Total face height	109.80	113.05	117.00	115.33	.....
Upper face height	62.15	64.60	66.20	.....	.....
Nose height	46.54	48.54	48.86	48.76	50.79
Nose breadth	47.48	46.88	46.28	51.52	48.40
Relative sitting height	49.28	48.96	48.12	.....	.....
Relative shoulder breadth	20.70	21.26	20.98	.....	.....
Cephalic index	70.35	72.96	72.81	72.05*	74.65
Length-height index	63.23	67.01	69.98	.....	.....
Breadth-height index	89.78	91.25	96.32	.....	.....
Cephalo-facial index	98.03	95.15	93.44	.....	100.18*
Facial index	79.48	80.98	84.06	85.86*	.....
Upper facial index	44.63	46.37	47.72	.....	.....
Nasal index	103.90	98.06	95.82	106.57*	95.29*

* Calculated from the means of the measurements.

TABLE 25. COMPARISON OF NORTHEAST AND NORTHWEST SUBGROUPS WITH
OTHER AUSTRALIAN GROUPS — *Continued*

	6 Central and South Australia-Arunta (Campbell and Hackett)	7 South Australia-Kookata (Wood-Jones and Campbell)	8 South Australia- Golden (Campbell and Lewis)	9 New South Wales- Kamilaroi, Berrigerra (Davenport)
Number	42	6	9	6
Stature	165.57	165.23	166.22	167.00
Sitting height	82.15	80.87	80.44	83.10
Biacromial diameter	36.05	...	34.42	...
Head length	192.48	194.67	192.00	196.50
Head breadth	143.20	143.33	139.11	146.70
Head height	127.29	122.33	114.67	...
Minimum frontal diameter	102.50	(114.50)	113.00	...
Bizygomatic diameter	141.05	137.50	138.44	...
Bigonial diameter	102.38	109.80	104.56	...
Total face height	114.55	111.67	114.22	113.00
Nose height	53.14	49.00	47.22	...
Nose breadth	50.06	50.00	49.33	...
Relative sitting height .....	...	49.46	49.17	...
Relative shoulder breadth .....	...	21.64	...	...
Cephalic index	74.28	73.67	72.67	48.22
Length-height index	66.14	62.67	67.62	20.67
Breadth-height index	89.00	85.33	93.62	74.70
Cephalo-facial index	92.51	96.00	...	...
Facial index	81.26	81.33	82.67	...
Nasal index	94.82	100.17	106.00	...

TABLE 25. COMPARISON OF NORTHEAST AND NORTHWEST SUBGROUPS WITH
OTHER AUSTRALIAN GROUPS — *Continued*

	10	11
	New South Wales- Kamilaroi (Taylor and Jardine)	New South Wales (Pöck)
Number	12	7
Stature	168.66	167.09
Sitting height .....	.....	83.94
Head length	198.00	194.43
Head breadth	146.00	143.14
Head height .....	.....	119.83
Minimum frontal diameter .....	.....	106.86
Bizygomatic diameter	(133.00)	141.00
Bigonial diameter .....	.....	109.00
Total face height	119.00	121.83
Upper face height .....	.....	69.00
Nose height	47.00	49.50
Nose breadth	50.00	49.71
Cephalic index	73.60	72.62
Length-height index .....	.....	60.87
Breadth-height index .....	.....	84.48
Facial index	90.00	87.44
Upper facial index .....	.....	49.52
Nasal index	108.00	100.07

24 ANTHROPOMETRY OF THE NATIVES OF ARNHEM LAND

For the rest of Australia there is very little actual material on the living subject.¹ Figures for seven other series, mostly mere handfals, have been collected and tabulated; these are confined to North, Central and South Australia, and New South Wales. West Australia, Queensland, and Victoria are thus unrepresented, although records have been made in West Australia which have yet to be published.² Included with the above groups in the comparative table and the "mean differences" are the Northeast and Northwest Arnhem Land samples, the former as the largest series of what has been called the "northern section" and the latter as representing the Victoria River sample as well. Though not listed, the other groups must also be commented upon in making comparisons.

TABLE 26. MEAN DIFFERENCES IN 7 HEAD MEASUREMENTS OF NORTHEAST AND NORTHWEST SUBGROUPS AND COMPARATIVE SERIES

	1*	2	3	4	6	7	8	11
1....	..	1.90	3.11	3.69	4.01	4.11	2.27	5.42
2....	1.90	..	1.66	2.44	2.98	3.27	1.58	4.17
3....	3.11	1.66	..	2.30	2.68	2.89	1.61	2.65
4....	3.69	2.44	2.30	..	3.00	2.67	1.55	3.51
6....	4.01	2.98	2.68	3.00	..	2.91	2.33	2.85
7....	4.11	3.27	2.89	2.67	2.91	..	2.58	2.24
8....	2.27	1.58	1.61	1.55	2.33	2.58	..	3.39
11....	5.42	4.17	2.65	3.51	2.85	2.24	3.39	..

* Column numbers refer to those in Table 25.

It will be apparent that while the people of various parts of the continent vary to a certain extent among themselves, the information here presented does not reveal an orderly scheme of physical types, if any such exists. Furthermore, it is not possible to say how much of this variety is induced by the small size of the groups or by differences in the technique used by the several observers.

The stature of the Australians is homogeneous (165-168 centimeters), with one exception: central North Australia, including the Northwest and Victoria groups, contains people who are several centimeters taller.

The head length throughout North and Central Australia does not differ much from 190 millimeters. It is probably greater in South Australia and New South Wales, particularly the latter. The head breadth rises from north to south: it is lowest of all in the "northern section," more or less on a level throughout the rest of

¹ See Appendix I.

² See Taylor, 1928.

North and South Australia, and highest in New South Wales. Although the means for head height in the south seem too low to be acceptable, the cranial material shows that a smaller difference in this character between north and south actually exists. (Cf. p. 36 ff.) In length and breadth, however, the head is larger in New South Wales than in the north. The cephalic index ranges between 72 and 74.7, excepting for the northern section of Arnhem Land, where all three groups indicate that it is an area of extreme dolichocephaly.

The minimum frontal diameter imparts no information. Several of the figures are undoubtedly too high, indicating mistaken technique. The bizygomatic breadth likewise reveals nothing, although, if the lowest figures are to be trusted, there is a total range in the means of 135 to 145 millimeters. Perhaps, as has been noted, the northern groups in the present series have wider faces than the southern groups. The bigonial breadth may be greater in the southern part of the continent. Both total and upper face heights and indices indicate that the face is shortest in the northern section, variable elsewhere except in New South Wales, where it is comparatively long (though Davenport's sample is not in agreement).

The nose is particularly short in the northern section, and relatively long in Central Australia; in the latter area, therefore, the index is somewhat lower than elsewhere. Furthermore, in the south the nose is the widest. In Australia, however, the nasal measurements vary a good deal, and in general they seem to be especially susceptible to errors of technique.

Mean Differences. These have been calculated from head measurements between most of the groups listed, without furnishing any further clues. In the present case this method must be a coarse sieve, due to the factors of small groups and uncertain technique. The figures seem to show in several cases that geography is a factor; i.e., that the more remote two groups are in space the more remote they are likely to be physically. However, this is probably due only to the peculiar features of the northernmost and easternmost groups, which we have already seen. Notice that there are hardly any mean differences greater than 3 except where these two groups (Nos. 1 and 11) are involved. On the other hand, geographically contiguous groups do not show any pronounced tendency to exhibit lower mean differences, except in the north, and it is possible that



FIG. 2.

MAP OF COMPARATIVE SERIES

- | | |
|---|-------------------------------|
| 1 Northeastern Arnhem Land | |
| 2 Northwestern Arnhem Land | |
| 3 North Australia | Burston, 1913 |
| 4 North and Central Australia | Spencer and Gillen, 1904 |
| 5 Central Australia-Arunta | Spencer and Gillen, 1899 |
| 6 Central and South Australia-Arunta | Campbell and Hackett, 1927 |
| 7 South Australia-Kookata | Wood-Jones and Campbell, 1924 |
| 8 South Australia-Ooldea | Campbell and Lewis, 1926 |
| 9 New South Wales-Kamilaroi, Brewarrina | Davenport, 1925 |
| 10 New South Wales-Kamilaroi | Taylor and Jardine, 1924 |
| 11 New South Wales | Pösch, 1915 |

the small difference between the Northeast and Northwest groups is due partly to the fact that they come from one observer, so that no errors of technique are present.

Except for the Northeast group, that from New South Wales (No. 11 on the map) is the most isolated in a physical sense. This fact is due entirely to the long face of this sample, which is an important difference if it is an accurate one. The group from Ooldea, South Australia, has the smallest differences in all directions, as in all measurements it is quite intermediate (excepting the suspect head height and minimum frontal diameter) and is probably a good representative sample for Australia as a whole, in spite of its marginal position.

In physical features, the people of the north and east of Arnhem Land are the most divergent of all these living groups, particularly in their marked dolichocephaly but also because of their short faces and noses. The only other striking local features are the increased stature in central North Australia and the long face in New South Wales (which needs confirmation), but it is also apparent that the head and the nose increase somewhat in size as one goes from the north through South Australia to New South Wales.

With the possible exception of the long heads of the north and the long faces and low heads of the southeast, it does not seem as if any points of difference have been found which are not ascribable to the effects of variation and isolation working on a single people spread out over a vast area. If there are intrusive or successive elements in the population they have yet to make themselves manifest, for in spite of the apparent variation in such characters as the nose form, one finds nothing which can be exhibited as "un-Australian."

Statistical Variability. This question has been approached in the following way. The standard deviations of different characters of a group may, in a crude way, be corrected for differences in dimensionality, and be made comparable, by dividing each one by a "mean sigma" for that character obtained from the standard deviations of as many different samples as possible.¹ (In the case of most characters the mean sigma was calculated from fifty or more series, each containing more than fifty individuals.) This process gives for each standard deviation a "sigma ratio" or percentage

¹ See a paper by the author: "Some uses of the standard deviation in anthropometry," in "Human Biology," vol. 8, no. 4, pp. 592-600. Dec., 1936.

28 ANTHROPOMETRY OF THE NATIVES OF ARNHEM LAND

indicating whether that standard deviation is high or low relative to the rank and file of different racial groups the world over. These sigma ratios may be pooled to provide a mean sigma ratio for the series in question. In the table below, the first column gives the mean sigmas for the characters listed, these being constant figures, applicable to any group, though in practice, series of less than fifty individuals give standard deviations which are too erratic to give information regarding biological variability.

	Mean sigma	Northwest		Northeast	
		Sigma	Sigma ratio	Sigma	Sigma ratio
Stature	5.8	5.94	102.4	5.64	97.2
Head length	6.2	7.83	126.3	4.83	77.9
Head breadth	5.2	5.10	98.1	4.50	86.5
Minimum frontal diameter	4.9	5.12	104.5	4.60	93.9
Bizygomatic diameter	5.3	4.90	91.5	5.20	98.1
Bigonial diameter	5.8	5.80	100.0	5.32	91.7
Total face height	6.4	7.10	110.9	5.90	92.2
Upper face height	4.7	4.90	104.3	4.70	100.0
Nose height	3.8	4.64	122.1	3.52	92.6
Nose breadth	2.9	3.78	130.3	3.30	113.8
Cephalic index	3.4	2.88	84.7	2.85	83.8
Cephalo-facial index	3.5	3.72	106.3	4.26	121.7
Facial index	5.1	5.04	98.8	4.72	92.5
Upper facial index	3.6	4.08	113.3	3.48	96.7
Nasal index	7.8	9.68	124.1	10.12	129.7
Mean sigma ratio . . . . .	..	..	107.9	..	97.9

The figure for Northeast Arnhem Land is quite usual, showing that the standard deviations are slightly less than average in size. However, a mean sigma ratio as high as that for Northwest Arnhem Land is likely to occur only when there is a pronounced reason, such as heterogeneity of sampling or a much-mixed racial type. Mean ratios of other groups for comparison are: Baining,¹ 100.2; Jakumul,² 92.2; Tjibitoeng, Java,² 99.4; Solomon Islands,¹ 104.7; Fiji,¹ 112.8. The figure for the total North Australian sample is 108.9, and for Burston's series it is 114.3. This latter is higher than that of Fiji, and the Fijians are Polynesian-Melanesian hybrids. However, it is doubtful whether hybridization increases variability in measurable characters, and whether variability indicates a mixture. It is probable that the high local degree of variation demonstrated both by Burston's and by Warner's Northwestern series means that the region (as well as the two series) contains slightly divergent local types, which when pooled produce an abnormally

¹ Howells, 1933.² Schlaginhaufen, 1914.³ Nyessen, 1929.

wide range. This is clearly the case with Warner's total sample, since it has been shown that the five subgroups differ from one another to a greater extent than random sampling would occasion. Therefore it is probable that Warner's Northwest sample contains a greater variety of local types than the means alone indicate, and it is plain that Burston's series, supposedly from Port Darwin, may contain a minority from the eastern part of Arnhem Land.

Variation in Hair Form. Since he first became the subject of interested scientific discussion, the belief has been often voiced that the native Australian was not particularly homogeneous in type; that while he formed a distinct racial group, his external features nevertheless enjoyed such a wide range of variation as to suggest a heterogeneity of origin. Although this notion is far from prevailing, it is important as affecting various theories to explain the Australian population, and it therefore should be evaluated carefully.

The first voyagers to see the natives came off with contrasting impressions. Most found them highly unpleasant both in mien and behavior; others considered them, if not prepossessing, at least graceful, mild and amiable. But the question of differing types seems to be traceable mainly to Topinard and the hair form. In "*L'Anthropologie*"¹ he says: "Mais le type australien est-il pûr? Chargé en 1872, par la Société d'Anthropologie, de rédiger les Instructions aux Voyageurs en Australie, nous fûmes, tout d'abord, frappés des divergences de description entre les Australiens des côtes, des plaines basses, de quelque points isolés du 'bush,' de la région du nord-ouest notamment; et les Australiens en masse de l'intérieur, des plateaux, spécialement de la région du nord-est." In an earlier work² he reviewed these descriptions from travelers which turn mainly on the form of the hair and employ a great variety of terms, both French and English; for other references to physical features are apt to be couched in abstractions (i.e. "kindly eyes," "forbidding visage"). It is quite true that the descriptions concerning separate locales do differ among themselves, recalling the descriptions of the elephant which the blind men gave. Topinard, therefore, believed that there could be distinguished in Australia an ogre-like woolly-haired element and a straight-haired, "beau" type, which had arrived in that order and fused in varying proportions to give the local varieties of Australians indicated by

¹ Topinard, 1877, p. 518.

² Topinard, 1872.

the accounts. De Quatrefages also asserted that there was a woolly-haired group in the vicinity of Adelaide.

Turner¹ did not agree that there existed either heterogeneity or woolly hair, and quoted Giglioli's suggestion that Topinard was misled by the "loose way in which the terms woolly and crisp" had been used by explorers. This is a suggestion which it is easy to accept when one reads Topinard's paper, and he admits himself the difficulty of giving an accurate interpretation and translation to many of the English descriptions.

When one looks for woolly hair in the precise figures and observations of recent years, it is not to be found, any more than are the fair-haired Polynesians of early stories. In a few localities the hair is predominantly curly, and occasionally strongly so, but over most of the continent it is very largely wavy. What seems ultimately to distinguish it from most of the forms of hair found in Melanesia is the absence of any frizzly or "crinkly" character. (This applies to head hair, for the beard in Australians often has this frizzled nature.) The percentage distribution of hair forms for Warner's groups in the north shows them to be almost entirely wavy or straight-haired, even curly hair being nearly absent. The same is true of the Central Australian (Arunta) sample of Campbell and Hackett, curly hair being uncommon here as well. Let us examine the data or notes on hair form of other authors who have published measurements. Spencer and Gillen have this to say regarding the tribes of central North Australia:² "It will be seen that in the matter of hair there is a very interesting series of variations. In the Arunta, it is always wavy and never truly curly, though occasionally the beard, which is always well developed, may be frizzled. In the Kaitish, it may occasionally be very curly. In the Warramunga it is normally wavy. In the Tjingilli it may be very curly. In the Suanji it is normally wavy, sometimes inclined to be curly, and is artificially made into a frizzled mop. In the Binbinga it is sometimes wavy, at others curly, and is plaited to form a kind of close-fitting skull cap. In the Anula and Mara it is, in both men and women, decidedly curly, approaching in appearance more nearly to the woolly type than in the case of any other tribe met with by us. It may perhaps be suggested that this indicates at some time a mixture with Papuan blood, but if so, the influence is

¹ Turner, 1908, p. 388.

² Spencer and Gillen, 1904, p. 53.

apparently confined to this one feature." Again, concerning the Arunta:¹ "When fully developed it falls down over the shoulders in long and very wavy locks. . . . The beard is usually frizzy rather than wavy, and in some cases this feature is a very striking one; but we have never, amongst many hundred natives examined, seen one which could be called woolly." Basedow gives photographs of two individuals of Port Darwin with hair which is probably of the type Spencer and Gillen call very curly, which it certainly is. Stirling, writing of the Horn Expedition to Central Australia, as well as of other experiences, says of woolly hair:² "In no case did we observe, nor have I ever observed, the existence of this essentially negroid characteristic, which has nevertheless been mentioned as occurring in Australia. The most that was noticed was a slight waviness." The mention of woolly hair is that of de Quatrefages.

In the two samples from South Australia, the hair is almost entirely wavy, three individuals in 28 from Ooldea having curly hair. There is again no trace of woolliness. Likewise among the Kamilaroi of New South Wales:³ "Among twenty full-bloods only three had hair approximating to curly. The remainder had hair with a wave. We saw only one full-blood . . . with definite curly hair." Pösch says flatly:⁴ "Die Australier sind schlichthaarig," but he illustrates one individual from New South Wales with strongly curled hair, which nevertheless could not be called woolly. On Cape York Peninsula, however, very curly hair seems to predominate, as described by Klaatsch (see Basedow) and as deduced from subjects illustrated by Mjöberg and by Roth. This type resembles the moppy hair of certain Melanesians, without being frizzly (as far as can be determined from the photographs); the curl is sufficiently strong to prevent its hanging about the face, though this may be due to its being cut short. This is probably of the same form as the curliest in North Australia, described by Spencer and Gillen, though one cannot be sure.

It seems clear, then, that no truly woolly or even frizzly head hair has been discovered among the living Australians. Throughout the continent, wavy or straight hair is typical, with a small proportion of moderately curly hair. In the north, however, as far as we can judge, strongly curly hair is to be found, in sporadic groups in North Australia, and commonly if not generally in northern

¹ Spencer and Gillen, 1899, p. 38.
² Taylor and Jardine, 1924, p. 285.

³ Stirling, 1896, p. 17.
⁴ Pösch, 1915, p. 17.

Queensland. Such curliness was also early reported among the natives near Bass Straits in Victoria, but it is probably too late to investigate the accuracy of this. As for the north, the question is raised of the possible presence of some sort of Melanesian blood, most probably from New Guinea. Such an explanation for curly hair was rejected as preposterous by Basedow, who claimed that this curliness was simply an expression of the natural range of variation of hair form for Australia; but Basedow was endeavoring to show this range to be very wide, in order to be able to include the Tasmanians within it. All other authors accept the possibility of immigrants without giving it much consideration.

Cranial Material. Before the question of homogeneity and intra-continental variation is abandoned, the evidence furnished by cranial material must be considered. Let us take abstract homogeneity first.

Berry, Robertson and Cross¹ assailed the point by comparing sigmas and correlation coefficients of Australians, Tasmanians, and "Papuan," concluding only that the Tasmanians were purer than the Australians. Robertson² handled the same Australian crania (almost all from Victoria), and found that in length and breadth the sigmas were equivocal, the former being without the limits set by Pearson for ordinarily homogeneous series, the latter within them; he concluded therefrom that the Australians were medium in the matter of homogeneity. In any case the evidence is not very important. The means and sex-ratio of this series, however, led Morant,³ probably justly, to question the accuracy of its sexing, which would affect the size of its sigma, since the inclusion of a large number of female skulls with the males would have the effect of amalgamating two frequency distributions whose means did not coincide, so that the sigma would of necessity be greater than that for a group of known males.

Morant⁴ undertook a fuller investigation in the following manner. He assembled all the published measurements of Australian crania and pooled them, by political divisions, after making as certain as possible that all individuals contributing to any given mean measurement had been measured by the same technique. For the six territorial groups the numbers of available skulls varied from approximately 17 to 39, and due to differences in various authors'

¹ Berry, Robertson, and Cross, 1910.

² Robertson, 1910.

³ Morant, 1927.

⁴ Morant, 1927.

choices of characters only 19 measurements and indices could be employed for comparison. On this basis, Coefficients of Racial Likeness were found between all six groups, the nature of which led Morant to conclude forthwith that excepting those from the Northern Territory, all the Australian crania belong "to a single racial type which shows some slight local variation." The entire lot, therefore, with the exception of those from the Northern Territory, he pooled in a single series, designated Australian A.

TABLE 27. AUSTRALIAN MALE CRANIA
DATA OF MORANT

	Queenland	New South Wales	Victoria	South Australia	Western Australia	Northern Territory
	19	28	15	39	17	17
Approximate number	1287.7	1287.7	1311.3	1319.6	1255.5	1224.2
Capacity	185.1	187.0	186.9	187.0	186.9	180.2
Flower's length	131.1	132.6	132.3	132.8	130.8	128.3
Breadth	95.2	96.7	96.7	96.1	96.8	94.3
Minimum frontal diameter	101.3	102.7	103.8	102.4	100.7	103.8
Basion-nasion diameter . .	133.3	136.1	134.3	131.5	132.6	132.8
Basion-bregma height . . .	375.7	372.8	379.2	369.4	373.0	361.1
Sagittal arc	510.2	518.1	517.5	518.2	507.3	501.9
Circumference	34.4	34.7	35.3	35.8	35.1	35.6
Foramen magnum length	29.1	29.3	30.4	30.9	30.2	30.4
Foramen magnum breadth	131.9	133.4	135.8	134.6	133.2	134.2
Bizygomatic diameter . . .	49.1	49.6	49.8	50.1	48.1	49.0
Nasion-subspinale height	26.4	26.5	27.5	27.1	26.1	27.6
Nasal breadth	34.0	33.6	33.6	33.4	33.3	33.4
Orbit height						
Length-breadth index . . .	70.5	70.8	70.6	71.2	70.4	71.3
Length-height index	72.3	73.0	72.2	70.6	70.6	74.0
Breadth-height index . . .	98.6	97.6	98.3	101.1	98.7	96.7
Foramen magnum index	84.5	84.2	85.7	86.4	85.4	85.3
Nasal index	54.7	54.2	55.3	53.8	54.7	56.7

The present author was desirous of examining further this assumption. Accordingly the deviations of each local group from the Australian A series in the means of 19 measurements and indices were found; these are set forth in Table 28 both in absolute size and in terms of their proper probable errors.¹ Table 31 gives a condensed tabulation of these differences in terms of probable error according to size. From these data one is led to the same conclusions reached by Morant. Of the five groups forming the Australian A series, only South Australia is possibly really aberrant, and even this is doubtful; at any rate, South Australia shows no connection with the Northern Territory in the Coefficients of

¹ These are calculated from the σ of the Australian group A and the x_1 of the subgroup.

TABLE 28. DEVIATION OF TERRITORIAL GROUPS FROM AUSTRALIAN A SERIES
WITH VALUE IN TERMS OF THE PROBABLE ERROR

Character	DATA OF MORANT				
	Queensland Diff. x p.e.	New South Wales Diff. x p.e.	Victoria Diff. x p.e.	South Australia Diff. x p.e.	West Australia Diff. x p.e.
Capacity	6.9	6.9	16.7	25.0	39.1
Flower's length .....	.4	.5	.9	1.9	2.2
Breadth	1.3	.7	.5	.6	.5
Minimum frontal diameter	1.1	.8	.1	.6	1.4
Basion-nasion diameter .....	.9	1.0	.6	.0	.7
Basion-bregma height .....	.8	1.1	1.7	.3	1.4
Sagittal arc .....	.2	3.0	1.2	1.6	.5
Circumference	2.7	.2	6.2	3.2	.7
Foramen magnum length	5.4	1.3	1.9	3.6	.0
Foramen magnum breadth .....	.8	.5	.1	2.6	8.3
Bizygomatic .....	.9	2.3	.4	.6	.1
Nasion-subspinale height	1.7	.3	.8	1.0	.4
Nasal breadth .....	.4	.2	.3	.6	.4
Orbit height .....	.5	1.3	.6	1.7	1.4
Length-breadth index .....	.5	.1	.3	.2	.8
Length-height index	5.1	2	.4	.7	.6
Breadth-height index .....	.7	3.1	.6	1.0	1.9
Foramen magnum index .....	.7	2.7	1.0	1.8	.6
Nasal index .....	.5	.9	.7	1.4	.4
	.1	.4	.7	.8	.1
				1.4	
				.8	
				2.1	
				2.5	
				3	
				4.7	
				2.6	
				3	
				.3	
				2.1	
				.3	
				2.5	

North Australia
Diff. x p.e.West Australia
Diff. x p.e.South Australia
Diff. x p.e.Victoria
Diff. x p.e.New South Wales
Diff. x p.e.Queensland
Diff. x p.e.

Character

Capacity

Flower's length

Breadth

Minimum frontal diameter

Basion-nasion diameter

Basion-bregma height

Sagittal arc

Circumference

Foramen magnum length

Foramen magnum breadth

Bizygomatic

Nasion-subspinale height

Nasal breadth

Orbit height

Length-breadth index

Length-height index

Breadth-height index

Foramen magnum index

Nasal index

Racial Likeness. Elsewhere the subgroups do not differ from the total more than would samples drawn at random from the A series with no regard to geography. The Northern Territory, however (which includes the present-day Central Australia), can be regarded as statistically distinct from the rest of the continent.

TABLE 29. DIFFERENCES OF TERRITORIAL GROUPS FROM AUSTRALIAN A SERIES TABULATED BY SIZE AS EXPRESSED IN TERMS OF THE PROBABLE ERROR

DATA OF MORANT					
19 Measurements and Indices					
	0-1	1-2	2-3	3-4	4-x
Queensland.....	7	9	3	0	0
New South Wales....	10	5	2	1	1
Victoria.....	13	5	1	0	0
South Australia.....	7	7	1	4	0
West Australia.....	11	3	5	0	0
Northern Territory...	6	2	4	2	5
Probability.....	9.50	6.13	2.55	.68	.12

It is correct to object to this demonstration that there is no reason why boundary lines surveyed by white colonists should bear any relation to somatological divisions among the aborigines, and that a tract as extensive as Western Australia may contain several types which nevertheless cancel each other's individuality when taken all together. To determine such a question calls for intensive study upon relatively restricted areas, or at any rate, a number of sizeable samples each of which is drawn from a single locality. This is the only way, for example, to tell whether the element which renders the Northern Territory physically peculiar is confined to this state or extends somewhat into Western Australia or Queensland. Nevertheless, the very fact that the political divisions constitute a more or less arbitrary splitting up of the native population without producing any recognizable distinctions even between the mutually most remote (always excepting the Northern Territory) seems a valid argument for the homogeneity of the population as a whole.

Morant compares the coefficients of variation of the Australian A series with those of the Egyptian E series (26th-30th Dynasty) and a series from a 17th century cemetery in Farringdon Street, London. The Egyptian series is remarkable for its homogeneity, and its coefficients are exceeded by those of the Australians in almost all characters. The English constants exceed the Australian

ones about as often as they fall below them in 24 characters, which is to say that, judged on this basis, variability is quite comparable in both groups. Morant believes the constants of the English crania "may be considered typical for a racially homogeneous European population," which is perhaps a questionable badge of homogeneity. On the other hand: "The population which extends over the greater part of a continent is less variable than a collection of individuals from a single London cemetery." One thing must be remembered, which is that low variability is not necessarily exactly the same thing as racial homogeneity, for other conditions besides the latter may govern variability, such as climate. As Morant points out, a racially homogeneous group might well have an inherent variability as a racial characteristic.

Metrical Characters of the Cranium. Let us examine the measurements themselves. The Northern Territory group, though divergent, is only moderately so. Of the 19 characters provided, only in 7 may the deviation from the total A series be called significant, these being capacity, Flower's length, cranial breadth, circumference, sagittal arc, and the length-height and breadth-height indices. All of the measurements deviate in a minus direction, so that the total resultant differentiation lies in a smaller cranial vault. The nasal index is slightly but insignificantly higher, though no corresponding differences are to be seen in the nasal measurements.

TABLE 30. AUSTRALIAN MALE CRANIA

Number	DATA OF HRDLÍČKA				
	South Australia 198	Northern Territory 108	Victoria 74	New South Wales 59	Queensland 52
Glabello-occipital length	190.9	185.5	190.8	190	186.7
Maximum breadth	133.1	129	134.4	132.7	131.3
Basion-bregma height	130.7	135.2	136.8	134.6	136.2
Bizygomatic diameter	135.6	135.2	138.8	134.5	134.6
Face height	114.5	112.5	113.2	114.7	113.2
Upper face height	69.6	69	71.1	69.7	68.4
Orbit height	33.5	33.2	33.2	33.2	33.5
Orbit breadth	38.6	39	39.2	39	38.7
Nose height	48.5	49	48.8	48.9	48.6
Nose breadth	26.7	27.4	27.9	27.9	27.5
Palate length	62.5	61.5	62.4	62.3	60
Palate breadth	68.3	67.2	69.1	69.2	67.8
Cranial index	69.7	69.6	70.4	69.9	70.3
Facial index	84.3	83.2	82.3	85.2	84.8
Upper facial index	51.2	51	51.2	51.4	50.9
Orbital index	86.8	85.1	84.7	85.1	86.6
Nasal index	55	55.9	57.2	57.1	56.6
Palatal index	109.3	109.3	110.8	111.1	113

The cranial index does not differ from that of the total. Finally, the height of the cranium is least in South Australia.

Though it has not been closely analysed, the material of Hrdlička¹ is more satisfactory, since it was obtained by a single observer. For the most part his 500 male crania do not coincide with or include the material compiled by Morant, being all in Australian Museums. The interregional differences seem to be of the same order and kind as those found by Morant. The length and breadth are definitely less in the North and next smallest in Queensland and Western Australia. There is hardly any variety in the cranial index. The height is strikingly less in South Australia than elsewhere. The face is somewhat longer in South Australia and New South Wales, a difference which is not apparent in the upper facial height. The most platyrrhine regions are New South Wales and Victoria, differences in general nose size being imperceptible.

The contrast between the north and the rest of the continent is not so marked as in Morant's work, but the differentiation of the north seems clear. Furthermore, the variations recorded above are almost entirely the same as those which were found on the living material, even though some of the trends are so slight as to be very questionable. One phenomenon remarked in the living is not shown by any of the cranial material; this is the lower cephalic index in the northeast portion of Arnhem Land, or from Melville Island around to the Roper River. It is possible to obtain two subseries, each of 13 crania, from Hrdlička's material, one from Melville Island and one from Anson Bay, which is between Northwest Arnhem Land and Victoria. The mean cranial indices are, respectively, 68.54 and 68.95, but the difference, while corroborating that found between the living of these areas, is too small to constitute real evidence.

Head Height in South Australia. The subject of the head height in South Australia merits further consideration. Both of the above groups of crania show it to be definitely less than elsewhere, and the fact has been commented upon by several authors. Turner remarked that in the south very often "the vertical index is less than the cephalic," which was not so in the north.² Duckworth, serializing the head height of a small group of crania from South Australia, found a double-humped frequency distribution.³ This does not appear in a seriation of Hrdlička's figures. Neither author, how-

¹ Hrdlička, 1928.

² Turner, 1884, p. 48.

³ Duckworth, 1904.

ever, considered this difference evidence for the presence of two racial groups, either within South Australia or the whole continent, in the absence of other differences, which is a rational view. The head height is also responsible for Dixon's findings that his "Proto-Australoid" type predominates in the south while the "Proto-Negroid" preponderates in the north, since these two types are differentiated by the length-height index. This fact led Dixon to postulate two separate successive groups of aboriginal immigrants.¹

Blond Hair in Australians. Although its relations to this discussion are doubtful, a phenomenon which should not go unmentioned is the sporadic or even frequent occurrence of light hair in many parts of Australia. Shades from dark brown up to a yellow-brown or straw color are reported, the latter being the rarer and in general restricted to juveniles. Hrdlička has seen it in several localities, and has discussed the phenomenon.² Mathew reports one or two cases from Queensland. Taylor³ found "tawny" hair common along the western edge of the desert in Western Australia, particularly among children, but also in about half the women. Basedow⁴ and Stirling both report varying shades of a color lighter than black to be common among children, but not adults, in parts of Central Australia. Two points are emphasized in several of the above works: the blond hair is not due to artificial bleaching, as in Melanesia; and the light color is most marked at the hair tips, seldom extending to the roots, a fact which does not indicate a very deep-seated blondism.

No explanation has been offered for this phenomenon. Juvenile blondism in European children is apparently the passing expression of a recessive character derived from mixed parentage. Does this indicate a fair-haired element and a mixed ancestry for the Australians? The evidence is somewhat against the probability that the light color comes from within. Possibly the manifestation rests on a purely genetic basis (cf. the "White" Indians of Panama⁵) such as a mutation which allows the hair to bleach out readily on exposure to the sun. At all events, pigmentation is a feature which in most animals is very susceptible to the caprice of the gene.

Summary of Findings. Concerning geographical differences in physical features, there are certain points on which the two compilations of crania and the material on the living are in agreement.

¹ Dixon, 1923, pp. 374-376.

² Taylor, 1924.

⁴ Basedow, 1925.

⁵ Hrdlička, 1926.

³ See Harris, 1926.

Principally, the head is smaller in length and breadth in North Australia, and particularly, according to the present data, in the northeast coastal portion. Although the data on the living are equivocal, the head seems to be lowest in South Australia, an oft-remarked fact. There are also slight but persistent indications that in the south the face is longer and the nose more platyrrhine, particularly in New South Wales. It should be noted, though the data are not reproduced here, that the female crania both of Morant and Hrdlička support the above observations on the cranial length, breadth, and height, and to some extent the others as well.

The living material furnishes two other points. There is an area of taller stature in central North Australia, and an area of extreme dolichocephaly comprising Melville Island and the north coast.

As to the homogeneity of the Australian population as a racial group, we may appeal again to the same data and point out with what great difficulty any regional differences can be established at all. Furthermore we find that local differences in a small area, such as that covered by the present material, are as pronounced as those between Morant's and Hrdlička's territorial divisions. Indeed Morant's groups were not found to differ even to a significant degree, though his method of pooling the figures of many authors may have generalized each of his groups to the extent that actual differences between them were hidden.

Statistical constants furnished by the crania indicate a variability neither high nor low, even though all but the Northern Territory is included. The standard deviation on the living is equivocal: it is low on the average for Central Australia but moderately high for North Australia, while there is no general sample for the whole continent. Probably local variation within North Australia is greater than within any other state.

Discussion. There are three explanations which may be offered for what departures from a dead level of physical uniformity are found. One, offered by Topinard, Dixon, and others, postulates two groups of aboriginal invaders who did not mix everywhere in the same proportions. Now the actual circumstances are not what Topinard supposed them to be, and while the south is differentiated by head height, as Dixon found, other differences are small and irregular, which does not indicate the presence of two types sufficiently discrete to be defined as such.

Another explanation lies in the possible intrusion of peoples from outside, not throughout the population, but only in sufficient amounts to modify the natives of a particular portion. It is incredible that some foreign blood should not have been introduced into the north of the continent, but it nevertheless appears that such admixture has had no effect upon the Australian type as a whole. Smyth states that intercourse and intermarriage take place constantly across Torres Straits, and continues: "The infusion of Papuan blood may not have entirely changed the character of any tribe, but it is there; and it is apparent where the Papuans have never been"; that is, diffused somewhat further south.¹ "On the northwest they have been visited periodically, for how many years no one can tell, by the Malays." Spencer,² however, doubts that the Malays have had the slightest influence, relating the danger which any intruder runs simply by his presence there, let alone in approaching a woman.

Finally, the most obvious hypothesis is that isolation and an unquestionably long lapse of time are accountable for the situation as it is found. Although this period of time seems to have brought definite regional deviations, none of the groups yet reported could properly be called typologically distinct. The one remarkable phenomenon is that an entire continent should be so homogeneous, while New Guinea, close on the north, teems with physically contrasting peoples. Next to Australia, North America probably has the simplest racial complexion, and it is instructive to contemplate the variety of types which might be found in any equal area of the latter. Even the Eskimos, taken by themselves, can hardly be compared with the Australians.

All that can be established at present, then, is that in a few characters certain regional differences obtain, and that the people of North Australia are the furthest removed from the general type.

COMPARISONS WITH OTHER RACIAL GROUPS

The origin of the Australians has always been one of the most absorbing topics of human phylogeny. Here in Australia is found the most primitive existing physical type combined with the most primitive material culture; yet these people have been able to

¹ Smyth, 1878, p. xvii.

² Spencer, 1914, p. 8.

formulate and administer the most formidable systems of kinship known to anthropology.

What, then, are their relationships with the rest of *Homo sapiens*? Several authors to the contrary, there is little reason to suppose that the physical type we recognize as Australian evolved in Australia, or that it has always been confined to Australia. There is an analogy in the American Indian: nobody now claims that he evolved in the New World; however, the facts in this case are more obvious. As with the Indian, one must search out the Australian's remote past by looking among other groups for people who may be related to him. There are suggestions that an "Australoid type" was once an important element in the populations of other parts of the world, even in America; the calvarium from Punin, Ecuador, is a case in point. Our task is therefore to find indications of the former range of the Australian type, before any estimate can be made as to the time and extent of its greatest importance.

As a preface to comparisons, the physical type of the Australian must be recapitulated. Of its external features the combination of a very black skin with hair that is not frizzly, but wavy or curly, is the most noteworthy. The long, narrow, keeled cranium with its beetling brows is another characteristic complex. The mouth region, with its long lips, projecting alveolar processes, large palate, and receding chin, is another. The nose is very short and bulbous, with wide and thick alae. The cumulative effect argues strongly for the theory that the Australian is a survivor from an actual level in the morphological development of man, and not merely a peripheral subracial type.

Metrical characters are a very dolichocephalic head and a nose which on the living is as broad as it is long. The face, though not extreme, is moderately broad and short.

In comparing the mean measurements of Australians with those of other peoples, the mild diversity which obtains between the several series raises somewhat of a difficulty, since some kind of choice must be made for a representative group. It would be improper to use the total North Australian series, since the evidence shows that some of the divisions (of this series), considered from the viewpoint of the whole continent, are aberrant, while the North-west and Victoria groups are quite typical. Since greater discrimination does not seem to be called for, we shall therefore use the

means for the Northwest group, which is the larger of the two, and round these figures off to the nearest unit. Compared to the remainder of Australia, this furnishes a group which is a little taller and has a head which is slightly shorter and narrower. Therefore, for head length and breadth a range is given rather than a mean. Otherwise, and on the whole, the approximation to the average seems good. It would be inadvisable to attempt to select representative means for all Australia, for many of the series are too small to be trustworthy, and since there are slight local differences, it seems better to have some geographical point of reference.

Melanesia. Australia's horizon is occupied on the north and east by Melanesian islands, of which New Guinea and New Caledonia are the nearest. The area occupied by the Negroid peoples of the Pacific is by nature that which should be first examined for evidence of present relationship with or past occupancy by the Australians.

Means are given in Table 31 for a number of Melanesian groups. These are not primarily representative of the peoples of Melanesia but are rather the only groups which approximate at all to the measurements of our Australians. Other groups may be discussed without quoting figures.

New Guinea, Australia's nearest neighbor, and nearly continental itself in proportions, affords little among its many types that might be referred to the Australians. The interior, only partially explored, is a logical refuge area where remnants of a possible former population of Australians might be looked for. But the typical inhabitants of the central portion¹ are very short, brachycephalic, and quite un-Australoid in all ways. While they differ in some respect from the Negritos of the Philippines and the Andamans, especially in a less platyrrhine nose, they must be accepted as pygmies and are probably slightly modified Negritos. The interior of the eastern part of the island, according to latest information mostly not yet recorded, appears to contain taller people who are like the coastal tribes.

The data for the south coast of New Guinea, in closest proximity to Australia, are poor.² The people are medium or tall of

¹ Cf. the Tapiro series (22) of Wollaston (1912) and the Goliath (12), Pesechem (44) and Morup (12) groups of van den Broek (1913, 1923). The first two named have mean statures of less than 150 centimeters.

² Koch, 1907; Haddon, 1915-1916. These are all groups of less than 20 men, and few measurements are given.

stature, and medium or long-headed, although pronounced brachycephals are found at the mouth of the Fly River. From Merauke is provided a series which is as close to the Australians as any which can be found, but the nose, an important character, is relatively narrow, in other groups as well as this. The face, too, is in this region generally narrower than in the Merauke sample, thus diverging from the Australians.

For the north coast, somewhat better material is available.¹ On the western part, the Bongko furnish another group which slightly resembles the Australians, but which, however, again differs from them in the face width and nose form. On the eastern part of the north coast, only in the village of Jakumul is there found a resemblance to the Australian averages. Elsewhere the cephalic index is higher. Reference to the material as a whole reveals a considerable variation in type; the two series named happen to be the most like the Australians in their measurements, but the prevailing type is very much like that of eastern Melanesia, as exemplified by the series from the Solomon Islands, given in the table, i.e., mesocephalic and not very platyrrhine.

The Bismarck Archipelago is a complex area in itself. Most of the information about living peoples concerns groups in southern New Ireland,² but it reveals little regarding the Australian question.

The Baining and certain other tribes are thought to be the oldest discernible stratum. While these people have a high nasal index, they are short of stature and brachycephalic. On the northeast tip of New Britain, however, there is a type which, in certain ways, does recall the Australians. This comprises Melanesian-speaking people who are believed to have invaded the region from New Ireland.³ The small sample from Ralum is composed of men measured at Berlin, at the Deutsche Kolonial-Ausstellung of 1896. While the measurements indicate them to be larger in every respect than the Australians, the head, face, and nose indices are very similar. It is justifiable to ascribe the large size of the Ralum men to the choice

¹ The principal series are: Cape Nelson (30), Potsdamhafen (34), Kai (57) (Bondy-Horowitz, 1932); Humboldt Bay (18), Lake Sentani (22) (van den Sande, 1907); Leitene (21), Arup (20), Torricelli (30) (Schlaginhaufen, 1914); Swarts River (27), Biak I. (28), Doreh Bay (10) (Witz, 1924, 1925).

² Except for records of a few measurements by Chinnery from southeast New Britain, the material is supplied by Friederici (1912) and Schlaginhaufen (1908, 1910), comprising several series ranging in size from 10 to 30, except for a group of 78 Baining.

³ Parkinson, 1907.

TABLE 31. AUSTRALIANS COMPARED WITH PACIFIC GROUPS

Author Number	Australians	New Caledonia				Uvea, Loyalty Islands	Santa Cruz	Solomon Islands	New Guinea		Ralum, New Britain (von Luschan) 7
		Total	North 67	Kanala (S.E. coast)	Sarasin (Sarasin)				Bongko	Jakumul (Schlagin- haufen)	
170	Stature	...	164.45	170.8	168.4	160.3	160.20	160	158.2	164.9	171.76
82	Sitting height	...	...	...	...	...	83.59	...	...	...	...
35	Biacromial diameter	...	...	...	...	35.9	...	...	...	37.8	...
189	Head length	(-192)	197.13	186.7	199	188	188.46	189.1	190.7	188	200.29
138	Head breadth	(-142)	142.29	152.3	148	144	144.73	136.2	141.2	141	146.71
126	Head height	...	...	...	...	122	...	...	...	...	...
105	Minimum frontal diameter	...	...	...	...	100.7	...	102.1	101.7	118 ²	105.43
140	Bizygomatic diameter	...	140.40	144	143.8	141	137.95	135.5	137.6	139	145.43
105	Bigonial diameter	...	...	...	...	98.4	...	102.6	102.4	106	109.00
113	Total face height	...	114.69	114.3	117.6	109.5	116.40	114.7	112.2	113	116.86
49	Nose height	...	47.85	46.78	48.8	48.1	...	49.86	53.4	51	51.57
47	Nose breadth	...	47.34	47.62	47.3	46	44.60	43.6	44.0	38	48.42
49	Relative sitting height	...	...	...	...	...	52.12	...	...	...	...
21	Relative shoulder breadth	...	...	...	...	22.4	...	...	...	22.9	...
73	Cephalic index	...	72.10	81.7	74.4	76.5	76.80	72.2	73.5	74.94	73.3
67	Length-height index	...	...	...	...	64.7	...	...	...	69.40	...
91	Breadth-height index	...	...	...	...	84.7	...	...	...	...	...
76	Fronto-parietal index	...	...	...	...	70.2	...	75	71.7	...	...
95	Cephalo-facial index	...	...	94.55 ³	...	98.3	95.36	100	97.8	98.58 ²	...
75	Zygo-frontal index	...	97.35 ²	98.67 ²	...	71.4	...	75.36 ³	73.3	84.6	72.49
101	Fronto-gonial index	...	...	...	...	97.3	...	100.49	100.69	...	...
75	Zygo-gonial index	...	...	...	...	69.4	...	75.8 ³	74.0 ²	76.2	...
81	Facial index	...	80.4	81.71	79.5	81.8	84.54	84.8	80.8	81.29 ²	80.74
98	Nasal index	...	99.3	102.18	97.5	96.2	87.14	82	86.8	74.50	94.06

¹ Calculated by the author from nos. 1-67 in Sarasin's tables. Includes territory north of Ouanga and Ousieme Rivers.² Extraordinarily high; probably not obtained by standard technique.³ Calculated from the means.⁴ This does not include the Loyalty Islands.

of good physical specimens for the exhibition. The reason for this is that a series of crania from the same place measured by the author but not yet published tallies very well in its metrical characters with the Australians (cf. Tables 31 and 32).

TABLE 32. GROUPS OF CRANIA OF MELANESIA

Number	Ralum	Gazelle Peninsula	North New Caledonia	Hienghene North Central New Caledonia
	101	11	22	14
Author	(Howells)	(MacCurdy)	(Sarasin)	(Sarasin)
Cranial length	184.09	182	187.3	185.4
Cranial breadth	131.06	130	129.2	130
Bizygomatic diameter . .	135.93	133	135.15	135.8
Face height	113.82	..	115.45	..
Nose height	48.42	48	48.3	48.6
Nose breadth	26.85	27	27.3	26.8
Cranial index	71.25	71	69.1	70.3
Facial index	83.71	..	86	..
Nasal index	55.57	57	56.7	55.2

In the central portion of Melanesia, as has been mentioned, no notable likeness to the Australians can be detected anywhere. The samples from the Santa Cruz and Solomon groups, given in Table 33, are neither sufficiently dolichocephalic nor sufficiently platyrrhine to warrant attention, and the same applies to the people of the New Hebrides.¹

New Caledonia and the Loyalty Islands form a center of particular interest in the discussion. The figures for the total series, measured by Sarasin, would be misleading alone, since there is a striking difference between the northern and southern portions of the island; a difference of nearly ten units in the cephalic index. The face is somewhat wider and the nose less platyrrhine in the south, but these are trivial differences by comparison. Sarasin explained these phenomena as variations of an originally homogeneous type. However, Polynesian influence is suggested as being responsible for the brachycephaly of the south by the presence of Polynesian languages in the Loyalty Islands, although one might expect such an influence markedly to have reduced the nasal index, which has not been the case.

However this may be, it is apparent that the people of northern New Caledonia stand closer in measurements to the Australians

¹ Speiser, 1928.

than any Melanesian group so far reported. The larger head diameters are the only important deviation. The southern part of the island has nothing in common with Australia except a high degree of platyrrhiny; however, in Uvea of the Loyalty Islands, although the measurements denote a larger head and face, the indices approach what we are looking for.

In these various comparisons only measurements and indices have been considered. On this basis there are a few groups whose pattern is like that of the Australians; these are found in northeast New Britain, northern New Caledonia, and a few places on the coast of New Guinea. In the case of the last-named, however, the nasal index does not conform, being much lower, and when these groups are taken together with their nearer neighbors, the Australoid aspect of their measurements appears to be quite fortuitous.

The people of Ralum and New Caledonia have the extreme platyrrhiny and the low cephalic index which one associates with the Australians, although the agreement in size is a little dubious. Nor do comparisons of the crania aid the discussion much. In the first place, the absolute measurements on the living (Australian) are very little greater than those on the skull. Either his soft parts are exceedingly thin, or his recent existence is more unfavorable to bodily development than his former one, in spite of missions. However, if the means in Table 32 are compared with the Australian figures in Tables 27 and 30, it is seen that the inter-group likenesses are stronger than those given by living subjects. At any rate, these are the best of such likenesses to Australian crania which the published material affords.

There are other aspects to this comparison besides the metrical. Photographs of the subjects of both the Ralum and New Caledonian series are given in their respective publications. There is very little in the physiognomy of the Ralum natives that resembles the Australian. The hair is woolly, and the conformation of the nose and mouth is on a higher aesthetic level, although the alae of the former are wide and flaring and the brow-ridges are heavy. None of the individuals pictured would be mistaken for an Australian. This is not true, however, of the population of north New Caledonia; here one immediately gathers from the photographs an impression of both Australoid and un-Australoid types, the former being in certain cases particularly striking. The large, bulbous tip

of the nose and the unshaped lips, both characteristically Australian, are frequently to be seen. Furthermore, there is considerable body hair, which may or may not be a feature of the Ralum population. The latter has at least a woolly beard of moderate size.

Like the face, the Australian type of cranium occurs frequently among the people of the two regions considered. Very few Australian skulls could be mistaken by the practised observer for another type. The conformation of the brow-ridges and forehead, the peculiar profile of the vault, the horizontal orbits, and alveolar prognathism combine to give the skull a characteristic aspect. Approaches to such a type are found to a small extent among skulls of New Guinea, but for the most part they look very different: the forehead is smoother and more bulbous (i.e. more "Negroid"), while in general the contours are different. Of the Ralum crania, however, a large number resemble those of Australians in type, while about one in ten could readily be mistaken for a true Australian. From photographs this statement appears to apply equally well to the New Caledonian crania.

This is little material from which to surmise how far the Australian type may have been extended, or have affected the other Melanesians. If the Australian type is present as an initial element in the people of New Guinea and Melanesia, and if the nasal index has been lowered by Malay blood, then the hair should not have become woolly, but should be even straighter than before. Hence the presumption that the Australian and the Melanesian are fundamentally different dark-skinned strains. In the two areas where the nasal index is equally high, the form of the hair remains a highly un-Australoid feature. In the same way, the crania show but a few morphological characters like Australians, again excepting those of New Britain and New Caledonia.

There is thus no tangible evidence that an Australian type had anything to do with the formation of the people of either the eastern part of Melanesia or New Guinea.¹ Nevertheless, it is necessary to consider the inference that Australians were once present in New Guinea, since some of the people of the Bismarck Archipelago and of New Caledonia have similar metrical characters and many of

¹ It should be mentioned that curly hair occurs frequently on the southeast coast of British New Guinea, as does also a light skin color (Seligmann). The tribes, however, speak Melanesian languages, and are probably recent immigrants from another part of Melanesia or from Indonesia; there is much better reason to ascribe the hair form to some sort of Mongoloid or Polynesian infusion than to an Australian element.

their crania present the same peculiar appearance. Ralum is at the northern end of New Britain, on the opposite side of New Guinea from Australia. And if the Australian type was able to get to New Caledonia, it may even have gone further.

There are strong negative inferences as well. If the Australians entered their domain through New Guinea, they should certainly have left marked traces behind. Even though one supposes that New Guinea subsequently served as a vestibule to the rest of Melanesia, the interior should have saved some Australian remnants from the inroads of invaders; instead, it harbors pygmies.

The people of Ralum and New Caledonia both speak Melanesian languages, of the Malayo-Polynesian family. It is plain that these languages are more recent in the Pacific than the "Papuan,"¹ non-Melanesian tongues of much of New Guinea and the western islands. Furthermore, none of the latter has been in any way allied to the Australian languages. Thus in New Britain and New Caledonia we are confronted with a supposedly archaic physical type speaking the most modern of the languages. This objection is not a great one, however: if the two groups are partly Australian, they are also partly something else, and this other strain would have brought the prevailing language.

Where there is smoke, there must be some fire. Only in Ralum and northern New Caledonia does there exist the combination of dolichocephaly and extreme platyrrhiny characteristic of the Australians, and in the latter place the physiognomic resemblance as well. On this basis either the evidence of common descent will have to be dismissed or the implication will have to be swallowed that the Australians were able to penetrate beyond Australia to New Caledonia and possibly further. The only other explanation (for both Ralum and New Caledonia) is that they were already mixed groups when they arrived in their present homes, and here the fact that they speak Melanesian languages becomes a real obstacle. Such a theory would imply that the Melanesian languages were earlier than the non-Melanesian languages in the Western Pacific, whereas the weight of evidence is against this belief.

Indonesia. The Indonesian area has been given more consideration somatologically than Melanesia,² and less groping will be necessary in the search for clues to an Australian-like element. The best-

¹ This term cannot at present be given any racial connotation.

² For material and discussion see Sullivan, 1918; Dixon, 1923; Kleiweg de Zwaan, 1925.

accepted theory supposes that at some time an Australian (or at least proto-Australian) type of man moved out of Asia and across the Indonesian islands to Australia. On such an assumption one might not expect to find this type in Melanesia, but Indonesia should be examined most carefully.

In certain respects students are in general and well-founded agreement as to the elements in the population of the area (which for our purposes will include the Malay peninsula). There is a perfectly definite Negrito stock, which comprises the whole population of the Andamans, and which appears in the hinterland of the Malay States and of the Philippines. This is characteristically very short of stature, woolly-haired, generally brachycephalic, and it has a low broad nose with an index over 90. In nearly all of these respects the type is one with the New Guinea pygmies. (The one difference lies in the mesorrhine nose of the latter.) The present existence of Negritos in Borneo or Celebes is denied by all, with only a few authors considering the possibility for Java and Sumatra. Nevertheless the inference is obvious, and disputed by none, that they must formerly have been present in almost all of the above islands.

The second readily isolable type in Indonesia is the Malay, presumably an immigrant from Asia and the last to arrive. It has as typical features very straight and black hair, a strongly Mongoloid countenance, brachycephaly and a lower nasal index and lighter skin than all other peoples. This is now the dominant element in the area, having appropriated the coastal regions of most of the islands, particularly in the west and north.

A different atmosphere is engendered by discussion of the peoples who do not belong to the above classes. Particularly is there a difference of opinion regarding the supposed stratum designated Indonesian, Ur-Malay, pre-Malay, or proto-Malay, and conceived of still more variously than it is named. Its most generally accepted traits are a sort of negative Mongolism, hair which is straight or wavy, and black or dark brown, a darker skin than the true Malay, a high nasal index and an occasional tendency toward dolichocephaly. Its habitat is generally inland relative to that of the Malay proper; and to it are assigned such peoples as Battaks, Dayaks, Toradjas, etcetera.

Several authors deny the existence of this Indonesian (proto-

TABLE 33. AUSTRALIANS COMPARED WITH PEOPLES OF INDONESIA

Number Author	Australian	Kroese 50 (Bijlmer)	Beloese 107 (Bijlmer)	Tonla 20-25 (Sarasin)	Toradja (Bugi, Maccassar) 17	Sumatra Sakai (Ajer Gumai) 43	Sumatra Atett 13	Malay States Semang c. 13	Malay States Sakai 78
Stature	170	161.85	159.6	157.3	162.3	154.74	151.88	152.42	151.95
Head length	189 (-192)	188.5	187.1	179.5	180.2	183.26	170.38	184.08	182.4
Head breadth	138 (-142)	138.1	141.1	147.5	147.8	138.60	143.54	142.92	142.7
Minimum frontal diameter	105	100.8	100.8	...	...	...	...	...	...
Bizygomatic diameter	140	135.9	134.4	139.9	136.5	126.51	119.08	135.10	134.4
Bigonial diameter	105	101.3	100.6	...	...	...	...	...	...
Face height	113	112.0	115.6	105.8	112.35	...	...	104.40	108.4
Nose height	49	49.8	51.7	...	...	...	...	40.59	44.6
Nose breadth	47	40.0	39.8	...	39.8	...	...	40.69	40.3
Cephalic index	73	73.2	75.6	82.2	82.1	75.98	84.32	77.72	78.5
Facial index	81	82.5	86.0	75.7	82.4	...	...	78.53	81.7
Nasal index	98	80.6	77.2	(100.2) ¹	(85.9) ¹	...	...	98.48	90.2

¹ Calculated by Sarasin from measurements on photographs.

Malay) type as an entity. Sarasin does not find enough difference between the Malays and the Indonesians to separate them, minimizing the discrepancy in the cephalic index; he concludes that the Malay is only a mixed strain of the Ur-Malay. Haddon, on the other hand, finds not one but two distinct proto-Malay forms. On the whole, however, the division of the Indonesian from the Malay has satisfied most workers.

The fourth element, of which the authenticity is likewise strongly debated, is the Vedda-like, or "pre-Dravidian" strain. The type has been sponsored principally by Sarasin and Kleiweg de Zwaan. According to these, it comprises specifically the Toala of Celebes and the Sakai (Senoi) of the Malay Peninsula (and Sumatra?), taking in as well the Vedda of Ceylon. Kleiweg de Zwaan believes that it crops out occasionally in the Menangkabau Malay and the Nias islanders; Ten Kate¹ claimed that it is present in the composition of the Battak and Dayaks, in the Lesser Sunda Islands and Mentawai; Moszkowski asserted that it was apparent in the Orang Kubu of Sumatra and in the Geelvink Bay region of New Guinea. Finally, it has been generally suggested that the Australians were members of, or allied to, this variety.

The characters of the type are fairly short stature, dark skin, and wavy hair. Other features are somewhat inconsistent. That the discussion centers around the hair form is obvious in all works on the subject. Martin found that the Sakai differed from the Semang in this feature alone, and concluded that they could not be intimately allied with the Vedda, but might be distant relatives of the Dravidians. The anthropometric evidence bearing on these "Veddoid" peoples will be inspected subsequently.

Besides the four types described, there is to be found a strong dark-skinned element in the eastern buffer territory between Indonesia and Melanesia, which comprises the Moluccas and the Lesser Sunda Islands. This has been commonly accepted as Melanesian or "Papuan" in origin, but it will be well to inquire where there has been an Australian contribution of any nature. In the Moluccas there is no reason to suppose that it is Negrito, since the gradation into the Melanesian native is continuous, through those islands nearest to New Guinea. These people will be treated first in the following detailed comparisons.

¹ See Kleiweg de Zwaan, 1925.

Moluccas. This group of islands affords no figures for comparison with Australians. The so-called Alfuru, the wild tribes of the interior of Ceram and some of the other islands, present common instances of dark skin and frizzly hair, which in all probability is the outcome of the admixture of some Melanesian strain to a fundamentally Indonesian type. If there is anything about this population which would shed light on the Australian question, it cannot be shown at present.

Lesser Sunda Islands. Considerable material was obtained for a number of groups in Flores, Timor, and Sumba by Bijlmer, more or less recapitulating the less fulsome results of Ten Kate. From the numerous photographs of individuals which Bijlmer publishes, such a welter of contrasting types appears that one is not surprised that he reached no finite conclusions. "One had better not speak of Papuans in Flores and Timor, and certainly not of Negritos . . . there is only a strong admixture of spiral-hairiness, and Mongoloid marks are nowhere entirely lacking."¹ Even these statements are questionable, for not a few photographs betray no "Mongoloid marks" whatever, but convince the beholder that he is looking at a Melanesian, Dravidian, Vedda, Australian, or a slightly modified Negrito. Bijlmer himself remarks upon the frequency of Australoid types. However, so marked is the influence of frizzly and woolly hair that the predominating black-skinned influence seems necessarily to be of a Melanesian type.

Aside from other differences between his various groups, Bijlmer concludes that there are two separate "Negroid" strains entering into the population as a whole, a dolichocephalic and a brachycephalic. But what these strains might be is not determined. There does not seem to be an Australian element of any size. The present author used Bijlmer's figures for Manggerai (the sample with the greatest range) correlating the cephalic and nasal indices. The coefficient of correlation is .065, revealing no association between a broad nose and a long head, an association which might be expected if there were a strong Australoid element mixed with a round-headed, narrow-nosed Malay strain.

The Kroenese of eastern Flores most nearly resemble the Australians in a metrical sense, although one gathers the impression that individuals of an Australoid appearance are commoner among

¹ Bijlmer, 1929, p. 189.

the Beloenese. As for the nasal index, which is lower here than among more Mongoloid peoples of Indonesia, there is possibly a slight error in technique, placing the nasion too high. There is no direct check; Ten Kate's "longueur du nez" for the same people was a little less. In any event, there is no gradation among the several groups from a Negroid to a Malayoid type. Furthermore, there is nothing in the figures to indicate that the dark element in these hybrids is Australian rather than some sort of Melanesian.

For want of better material, the only evidence of an Australoid element in these islands is photographic. Yet this evidence is very convincing, for the present author has never seen such pronounced Australoid types in photographs from New Guinea and Melanesia, excepting New Caledonia. Nor is it probable that within a few generations Australian blacks have by some accident reached these interior regions. The existing geographical and anthropological conditions suggest that the whole Lesser Sunda chain has the nature of a racial fish-trap, retaining specimen groups of several types which have invaded Indonesia as a whole, without providing asylum for their continued existence in isolation, and so forcing an amalgam.

Celebes. Sarasin¹ has distinguished three layers of population in Celebes. The Toala, the supposed aborigines, and thus named by Sarasin, are scattered thinly throughout the interior of the island. These are short, with a large proportion of strongly wavy or curly hair. The Toradja stratum, which includes the Bugi and Macassar, comprises the main body of the population. The Minabassa, of the northeast peninsula, are apparently a fairly recent intrusion. Sarasin considers the Toala and Toradja to constitute entirely separate immigrations and believes that the Toala (together with the Sakai of the Malay States) are akin to the Vedda, while the Toradja belong to the pre-Malay stratum of Indonesia. If the Toala are connected with the Vedda, then it is necessary, as will become apparent later, to compare them also to the Australians.

The author has lumped together all Sarasin's Toala in order to get a larger sample, which also seems to be more representative. Photographs of these people do not recall Australians, but in certain respects their measurements are alike. The nose is probably

¹ Sarasin, 1906.

strongly platyrrhine, and the face is relatively broad and short. Here, however, all likeness ceases. Only the hair form suggests any affinity. The Toala are brachycephalic; they are also shorter than the Australians and apparently smaller in every way. Finally, most of the Australian facial characteristics are quite lacking.

Sarasin found difficulty in reconciling the brachycephaly of the Toala with the dolichocephaly of the Vedda, as well as a marked difference in body proportions. However, he minimized the importance of the cephalic index and grouped the two together anyhow. The likeness between the Toala and the Sakai is more convincing, as will be pointed out.

There is no reason for considering the possibility that the Toradja and Australians are allied. However, it should be mentioned that Kleiweg de Zwaan, with some justice, does not regard the Toala as definitely separable physically from the Toradja. The latter seem merely to exhibit a stronger, if somewhat irregular, Mongoloid influence. This has been most marked in the Bugi and Macassar, for whom figures are quoted; other groups of Toradja given by Sarasin are considerably more like the Toala in the dimensions of the nose and face, as well as stature. They are not quoted here because the numbers are small.¹

Borneo. From the island of Borneo no Negrito-like types have ever been reported, nor are any claims made for a Veddoid group as such. In the generally accepted scheme for Indonesia, the people of Borneo would fall mostly into the "Indonesian" division, although among such groups as the Kayan and Klemantan Mongoloid characters are strongly marked. Haddon proposed two subtypes, since there is a small minority of dolichocephalic groups;² aside from dolichocephaly, however, these last exhibit no Australoid characteristics. The best series from Borneo is one of 108 Kenya men.³ These are low mesocephals with comparatively long heads, and a nasal index of about 82.⁴ In spite of problems peculiar to Borneo, however, there is no apparent reason to suspect Australian elements in any known group.

¹ For several small series (few measurements) see also Lubbers, 1893.

² Haddon, 1901, 1912.

³ Balner and Lebzelter, 1935.

⁴ In the long list of groups for which Haddon gives a few data, the nasal index is very high, being over 90 or close to 100 in most cases. That there is involved a constant personal error on the part of the original observer is made probable by two facts: subjects illustrated in photographs do not look extremely platyrrhine, and nasal indices of Bornean groups given by other writers range from 80 to 85.

Philippine Islands. According to the writers ¹ who have given the problem their attention, the population of the Philippines resolves itself easily into three types: the Negrito, which is most numerous in Luzon; the Indonesian (Pagan) element, comprising such people as the Nabaloi, Bontok, etcetera, of the hill country of most islands; and the Malay element (Tagalog, Bisaya, etcetera) which dominates the coastal regions of the group. Nowhere is there mention, or evidence, of an Australoid or Veddoïd type. The Pagan tribes tend towards lower cephalic indices and extreme platyrrhiny (85-100); in this and in general physiognomy they resemble tribes in Borneo. Furthermore, the high nasal index is vouched for by several authors.² However, reference to a few of the other physical characteristics of these people again demonstrates that a high nasal index does not necessarily indicate relationship with the Australians.

Consideration of the Negritos is hardly necessary, though it may be said that they are here found with all their typical features in full bloom: short stature (147 centimeters), a black skin, woolly hair, brachycephaly, and marked platyrrhiny.

Java. Although decisive opinions have not been broached as to the composition of the Javanese, the material ³ which has been collected shows them to be fairly homogeneous physically, characterized by a cephalic index of about 85 and a nasal index of the same figure. According to Nyessen, the Priangan mountaineers of western Java have a low nasal index (*circa* 72), but this may be due to an error in his technique, which is not described. Nyessen also offers a classification of the Javanese, based on his own impressions, in which one type is "Dravido-Australoid" and another is reminiscent of the Semang and the Bushmen; but it is impossible to tell from his paper whether the scheme has any value. All other writers expressly deny the existence of a Negrito stock, and make no mention of Australian or Vedda-like types. The Kalangs and the Tenggerese of eastern Java are generally considered to represent the pre-Malay or Indonesian stratum in Java. No precise data are available on the form, but Kohlbrugge ⁴ has reported on the Tenggerese. These are mesocephalic, with a given nasal index of 100;

¹ See principally Sullivan, 1918.

² See Sullivan, 1918.

³ Nyessen, 1929; for various small or medium series from Java, Sumatra and Borneo, see Hagen, 1890; Garrett, 1912.

⁴ Kohlbrugge, 1898.

from these and other characters they seem to be of the same type as the Indonesian tribes of Borneo and the Philippines, already described.

Sumatra. Besides the true Malays as represented by the Menangkabau Malay¹ and characterized by a long face and relatively narrow nose, other elements in the population include such peoples as the Battak, the Orang Kubu, and the Sakai. Dixon was inclined to group these together, remarking on their resemblance to the Sakai of the Malay States, and suggesting that they contained a submerged Negrito element. Hagen, however, allies the Battak to the pre-Malay stratum, and assigns a mixed origin to the Kubu² (small brachycephals and large dolichocephals) though in the last instance the data are too few to render the analysis conclusive. As for the Sakai of Siak, and the neighboring Akett, material has been furnished by Moszkowski.³ He believes the Sakai to be identical racially with the Sakai of the Malay Peninsula, and with the Vedda. The Siak Sakai are short and dolichocephalic, while the Akett are shorter still and brachycephalic; both have wavy and curly hair. The spontaneous explanation for the Akett is that they are of Negrito stock, but the absence of black skin and woolly hair is a deterrent to its acceptance, while it also appears that there is a Mongoloid influence in the facial characters of both the Sakai and Akett.

Malay Peninsula. Here are found two groups to which attaches considerable interest: these are the Semang and the Sakai. The Semang are generally grouped with the other Negritos of Indonesia, those of the Philippines and the Andamans. They are short, though not extremely so; they have also a very dark skin, woolly hair, and a platyrrhine nose, as well as the characteristically very short face. In one respect they differ from the other Negritos: the cephalic index is four or five points lower, placing them at the border of dolichocephaly. Concerning the nose it should be remarked that Martin obtained an average index of 83.5 for four individuals, while Skeat and Blagden give 101 for five. In spite of Martin's reputation as a technician, there is probably more justice in accepting the higher figures. The reason for raising the question

¹ Kleiweg de Zwaan, 1914: a large series.

² See also Volz, 1900, for series of 9.

³ Moszkowski, 1908.

at all is that if Martin's meager data are accepted, the Semang would appear as slightly taller and less platyrrhine than the Sakai, which is not in agreement with what other workers have found.

General opinion, following Martin's lead, has constituted the Sakai as a separate racial element from the Semang. The Sakai exhibit wavy or curly rather than woolly hair; they may or may not be slightly taller, and they have somewhat longer faces and a lower average nasal index.¹ The cephalic index varies among different groups from 76 to 80, but in general appears to correspond with that of the Semang.

Virchow and Sarasin, as well as numerous others, have contributed to one general theory in linking the Sakai to the Vedda of Ceylon and thus to the hypothetical pre-Dravidian or Dravidio-Australian race group, which differs slightly in conception from one author to another. Martin, however, preferred to be non-committal on the point. Furthermore, Martin, in spite of his separation of the Semang from the Sakai, stated that no definitive differences could be established between them outside of the hair form. And it seems probable from a number of the published photographs that woolly hair is not universal among the Semang, nor is woolly or nearly woolly hair unknown among the Sakai. At any rate, the question of the Sakai is an important one in this discussion of the Australians.

Little orderly arrangement has been found among the remaining peoples of the Peninsula. Martin groups them together but designates them as a "Rassenaggregat." In general the nasal index is mesorrhine, standing at 80 or below; some have straight or slightly wavy hair, with a cephalic index which approaches dolichocephaly, while others are more purely straight-haired with a definitely brachycephalic index. This indicates that in the Malay States there are the same two strains, the Indonesian and the true Malay, which have been described in the several islands.

Summary of Indonesia. Nothing very much like the Australian black has been found in this area. The closest approach is probably to be found in individual types among the heterogeneous population of Timor and Flores. The next which suggests itself

¹ Kloss, 1915, arrived at his figures by combining his material with that of Annandale and Robinson, which gave almost identical means throughout. Both series are Sakai of Perak.

58 ANTHROPOMETRY OF THE NATIVES OF ARNHEM LAND

consists of the supposedly connected Toala and Sakai; here the best argument for such a view lies in the wavy hair. These two groups are believed by many to be allied with the Vedda, who in turn are believed to be related to the Australians. There is no apparent reason for attempting to connect the Negrito, Indonesian, or Malay groups with the Australians.

The "Pre-Dravidians." Before further considering the probability that the "pre-Dravidian" element in Indonesia is related to the passage of the Australians through this territory, let us attempt to resolve the pre-Dravidian element itself. As it is constituted (by Sarasin, Kleiweg de Zwaan, and others), it comprises Vedda, the Sakai, and the Toala. To begin with, there is no great resemblance in head measurements and stature between the Vedda and the other two (the Vedda resemble the Semang equally well); on the contrary, the Vedda are a purely dolichocephalic strain. The hair form is of course similar, but the facial resemblance so often mentioned is seen from a large number of photographs of Sakai and Toala¹ to be largely imaginary, while Negrito characteristics, particularly in the Sakai, are pronounced.

TABLE 34. GROUPS RELATING TO THE "PRE-DRAVIDIANS"

Number Author	Vedda 8 (Deschamps)	Semang 13 (Annandale & Robinson)	Sakai 78 (Kloss)	Nias C. 1295 (Kleiweg de Zwaan)
Stature	157.5	152.42	151.95	154.73
Head length	189.62	184.08	182.4	181.0
Head breadth	137.12	142.92	142.7	146.1
Bizygomatic diameter (c. 134?)	135.10	134.4	138.0	138.0
Face height	105.75	104.40	108.4	112.8
Nose height	46.07	40.59	44.6	49.3
Nose breadth	38.78	40.69	40.3	38.1
Cephalic index	72.31	77.72	78.5	80.72
Facial index . . . . .	..	78.53	81.7	81.74
Nasal index	84.18	98.48	90.2	77.28

The alternative theory as to the origin of the Sakai is therefore that they have been produced by an ancient admixture of the Indonesian or proto-Malay strain with the indigenous Semang.² The slight differences in measurements between the Sakai and the

¹ Martin and Sarasin.

² This is Dixon's suggestion. He considers that the Semang themselves were formed by the adding of a Negroid-Australoid strain to a pure Negrito, as exemplified by the Andamanese.

Semang should be considered in the light of the measurements given in the table of the people of the island of Nias, who are good representatives of the Indonesian type. In this way the longer face and lower nasal index of the Sakai are easily explained, to say nothing of the hair form. All too little is known of the behavior of hair form in racial crossing, but it seems that the spiral hair of the Negro or Negrito when crossed with straight or wavy hair of the European type produces curly or wavy hair, which, however, retains somewhat of a crimped or frizzled quality. The hair of such a Mongoloid strain as the Indonesians, even though slightly wavy, might impart a somewhat smoother character to the hair of such a mixture as has been suggested, but this is only speculation.

This explanation seems to have no serious drawbacks, and conforms to the principle of conservation in the number of ultimate racial types postulated, since it is thus unnecessary to regard the Sakai as a separate group originally. The corollary is, of course, that the Toala represent an original Negrito stratum in Celebes which has been overwhelmed by the Indonesian Toradja.

One more fact should be noted: osteological material from the Malay Peninsula,¹ which is apparently fairly old, reveals people some of whom are short and some medium, but all very dolichocephalic, whose crania are said to resemble those of Australians and Vedda.

Asia. We temporarily continue on the hypothesis that Australia was not the scene of the evolution of the native type, but that the population came by way of Indonesia from the Asiatic continent. We ignore for the moment suggestions as to the Australoid affinities of the Moi of Indo-China or the Ainu of Japan, and pass at once to consideration of the more primitive peoples of India and the Vedda of Ceylon.

India. Until recently the best existing survey of physical types in India was Dixon's treatment in his "Racial History." The people of India are predominantly dolichocephalic throughout (except on the west coast). Proceeding from the northwest to the east and south, the stature tends to diminish, the hair to curl, the skin to darken, and the nose to flare. This train of change culminates in the Dravidians and the wild jungle tribes. The "Dravidians" constitute a language family which covers the southeastern

¹ Duckworth, 1934.

60 ANTHROPOMETRY OF THE NATIVES OF ARNHEM LAND

portion of India, and comprises a variety of tribes and types, from these same jungle tribes to the pastoral Toda of the Nilgiri Hills.

TABLE 35. AUSTRALIANS COMPARED WITH PEOPLES OF INDIA

Author Number	Southern India				Chota Nagpur		Bengal
	Australians	Toda	Polyan	Kurumbar	Oraon	Munda	Malé
		(Thurston)	(Fawcett)	(Mullu) (Fawcett)	(Risley)	(Risley)	(Risley)
		25	25	25	100	100	100
Stature	170	169.6	150.6	161.1	162.1	158.9	157.7
Sitting height . . .	82	87.9	..	..	..	..	..
Biacromial diam. .	35	39.3	36.6	38.3	..	..	..
Head length 189(-192)	194	188	193	184.6	185.9	183.6	183.6
Head breadth 138(-142)	142	137	136	139.3	138.6	137.5	137.5
Head height	126	130	..	127.2	129.2	126.3	126.3
Min. frontal diam. .	105	..	..	101.9	101.5	100.5	100.5
Bizygomatic diam. .	140	127	130	130.4	130.7	131.4	131.4
Bigonial diameter .	105	96	103	103	..	..	..
Nose height	49	47	40	46.2	44.7	43.9	43.9
Nose breadth	47	36	38	39.8	40.2	41.5	41.5
Relative sitting ht. .	49	51.83 ¹	..	..	..	..	..
Relative shoulder breadth	21	23.17 ¹	..	23.77*	..	..	..
Cephalic index . . .	73	73.3	73.4	70.3	75.4	74.5	74.8
Fronto-parietal ind.	76	..	..	73.15*	73.23*	..	..
Cephalo-facial ind. .	95	89.44 ¹	..	94.12*	93.61*	94.30*	..
Zygo-frontal index .	75	..	..	78.1	77.6	76.4	..
Zygo-gonial index .	75	75.7	79.5	80.4	..	..	..
Nasal index	98	74.9	94.1	86.9	86.1	89.9	94.5

* Calculated from the means.

"The affinities of the Australians, more or less, with the 'Dravidians' is now generally accepted," wrote Haddon,¹ and this acceptance has so far been based upon external characteristics, or the fact that both groups possess dark skins, wavy hair and general hairiness, and heavy brows and wide nostrils. Furthermore, the sporadic presence of the boomerang in India and supposed points of resemblance between the Dravidian and Australian languages are two bits of evidence which have been used by several authors to bolster up the argument from the ethnographical side. The theory of the connection, with its history and contributors, is well set forth by Thurston² in the introduction to his "Castes and tribes of Southern India." Notwithstanding, nobody appears to have made a direct comparison of measurements, probably because of the paucity of data on Australians.

¹ Haddon, 1899, p. 433.

² Thurston, 1909.

The latest contribution to the anthropology of India is a considerable one: that of Guha in the Census of India.¹ The author uses the Coefficient of Racial Likeness to orient a great many different groups, for most of which he obtained the material himself. Unfortunately for the present study, he presents almost no material on the jungle tribes and the Dravidians, but uses other sources in his comparisons.

Besides three principal modern strains, Guha finds two different elements remaining from the aboriginal population.² The first is short and dolichocephalic with a short, broad face, and a small, flat, wide nose, and with wavy or curly hair and a skin of a dark chocolate brown, approaching black. He finds the type "predominant among the aboriginal tribes of Central and Southern India," and believes it to be allied to the Vedda, the Toala, and the Sakai. He also believes the Australians to represent the type in a more primitive form. Its best examples are the Bhils of the Vin-dhya and the Chenchus of the Farhabad Hills.

The second type is a "dark pygmy strain having spirally curved hair, remnants of which are still found among the Kadars and the Pulayans of the Peramabiccullan Hills."

As to the wild jungle tribes, it now seems clear that they derive in part from a Negrito base, corresponding to the type defined by Guha. This theory, as Guha says,³ was formerly unpopular among anthropologists, since woolly hair was apparently unknown. Guha, however, describes and illustrates individuals of the Kadar tribe with strongly woolly or frizzly hair, and quotes reports that in this tribe such hair used to be very common. Superficially regarded, the wild tribes resemble the Semang (and the Sakai) of the Malay Peninsula in physiognomy, rather than the Australians. They are, in the main, black-skinned and dwarfish, with very broad noses and a tendency toward strongly curled hair.⁴ Thurston lists the means of a few measurements and indices for 74 south Indian groups, of which 11 are jungle tribes. Among the latter the nasal index ranges from 80.1 to 95.1, while for the remaining 63 samples

¹ Guha, 1935. "Census of India, 1931: Racial Affinities of the Peoples of India." Another recent approach to the problem is a paper by von Eickstedt, 1934: "The position of Mysore in India's racial history." As his classification is a subjective one, which he does not attempt to demonstrate by means of anthropometric data, its validity cannot be assessed, nor does it aid in the present study.

² See Guha, 1935, pp. lxii and lxiii.

³ Guha, 1935, p. 1.

⁴ Thurston, 1909.

the range is from 71.1 to 81.5. The stature of the jungle people is lower than that of the other groups, running from 150.5 to 162.5 centimeters. For specific examples may be taken the Paniyan and Kadir tribes, which are more fully described and illustrated by Thurston in another work.¹ The one fact which weighs most strongly against the belief that the jungle people are of Negritoid origin (though not so much against a Semang or Sakai connection) is their general dolichocephaly. A group of Polayans of Malabar, given in Table 35, is representative of these forest tribes. They are short and very dark and have strongly waved and curly hair. Their cephalic and nasal indices are comparable to those of the Australians, but in absolute dimensions they are much smaller.

We may next examine other Dravidian-speaking groups as a hunting ground for Australoid elements, probably of the first type described by Guha. The means of several tribes are given in Table 35. The Toda inhabit the Nilgiri Hills along with such other pastoral and agricultural people as the Kota, the Bagada, and the Irula.² The Toda are the tallest of the region, and the hairiest, with well developed brow-ridges; they are also, together with the Bagada, relatively light-skinned. As Table 35 indicates, they are the only Dravidian people who compare with the Australians in size.

The general hairiness of the Toda, together with the fact that their hair is less curly than that of other Dravidians, has led a few writers (e.g. Howitt³) to believe that they represent a dark-skinned stock which might have contributed these characters of the hair to the Australians. However, the Toda are lighter-skinned than other Dravidians, as well as taller, facts from which Dixon and others conclude that they themselves are remnants of the original Aryan invasion from the west who have maintained themselves against mixture better than their neighbors, which would place their advent too late to be concerned in the hypothetical formation of the Australians. The Irula, like the Kurumbar of the Malabar coast, are dark-skinned and of an Australoid physiognomy. The Kurumbar are seen to have a much higher nasal index than the people of the Nilgiri Hills (excepting the Irula), approaching that of the jungle tribes, with whom they are traditionally connected. In Chota Nagpur there live a number of tribes with Australoid physical characteristics, though they do not have these to the same de-

¹ Thurston, 1897.

² See Fawcett, 1900; Schmidt, 1910.

³ Howitt, 1904.

gree as the people of Southern India. Principal among these are the Oraons, an important Dravidian-speaking group. These are said by tradition formerly to have been one tribe with the Malé and Mal Paharia,¹ and to have entered Chota Nagpur from the west, pushing the Munda, who occupied the plateau, ahead of them. The Munda speech is a family entirely separate from the Dravidian, and said by Schmidt to belong with Mon Khmer, Sakai, and Semang. However this may be, it is readily seen from the measurements that the present physical affinities of the Oraons are with the Munda, and not with the Malé. If the Oraon once belonged with the Malé, something has modified the nose and stature of one of them. The Malé appear to resemble the jungle tribes of the south more than any other group.

TABLE 36. AUSTRALIANS COMPARED WITH CHENCHUS OF FARHABAD HILLS, INDIA

Author Number	Australians	Chenchus (Guha) 23
Stature	170	164.95
Head length	189(-192)	185.17
Head breadth	138(-142)	134.83
Minimum frontal diameter	105	100.83
Bizygomatic diameter	140	129.00
Bigonial diameter	105	93.39
Total face height	113	110.00
Upper face height	65	61.35
Nose height	49	48.22
Nose breadth	47	38.98
Cephalic index	73	72.89
Fronto-parietal index	76	74.85
Cephalo-facial index	95	95.75
Facial index	81	85.26
Upper facial index	46	47.56
Nasal index	98	81.38

The Chenchus (see Table 36) are a group which Guha considers best portrays the aboriginal Vedddoid, or non-pygmy, element in India, already referred to. The one individual of this tribe whose photograph is published by Guha looks extraordinarily like an Australian. He describes them² as having skin ranging in color from tawny brown to dark chocolate brown, and hair which is generally black and in most cases wavy, with small proportions being straight or curly. Supra-orbital ridges are well marked. The

¹ See Roy, S. C., 1915.

² Guha, 1935, p. xlv ii.

measurements show that the group is smaller than Australians in all dimensions of the head, particularly in the facial breadth, but that in the indices there is a fairly strong resemblance.

As to the question, therefore, of Australian-like peoples in India, we see that the measurements are on the whole not encouraging. A degree of dolichocephaly prevails among the Dravidians similar to that in Australia, and the head is of much the same size. The nose, while sometimes very platyrrhine, is variable and on the whole much smaller than in Australia. A serious difficulty in the comparison is the narrow face in the Indian groups, while almost no data exist for the facial height.

Ceylon. The Vedda of Ceylon present a much better likeness to the Australian natives than do any of the Indian tribes, and this strong likeness has been mentioned by a horde of writers. Briefly put, the Vedda seem like a less extreme form of the Australian. The hair is wavy or curly, but the general body or facial hairiness is less than in Australia. The brow-ridges are prominent and the nasal root depressed, but the nose is not so broad or heavy, nor is the jaw so prognathous¹ as in the Australians.

The measurements of the Vedda (of which few are available) correspond closely with those of Australians. The only essential differences are the lower stature and the smaller, less platyrrhine nose of the former. As to the face, the bizygomatic diameter given by the Sarasins is doubtless more nearly correct than Deschamps's,² which is unreasonably low. Allowing this assumption, the faces of the Vedda are thus somewhat smaller than the Australians, but still the bizygomatic breadth is greater than that of other Indian peoples. (The Singhalese are introduced simply as a contrast to the aboriginal Vedda.)

It seems pertinent to quote here, without interpretation, from Dixon,³ whose segregation of the Vedda into his own types gives evidence of another sort of their pronounced affinity with the Australians, compared to South Indian groups: "In head-form analysis of the data shows a very large majority of dolichocephalic forms, the Proto-Australoid and Proto-Negroid being present in nearly equal proportions, the Caspian type being present as a small minority, while of brachycephalic factors there is hardly a trace. The Vedda thus are comparable with the Tamil population of

¹ See Seligmann, 1911.

² See Table 35.

³ Dixon, 1923, p. 264.

southern India (Dravidians), with the brachycephalic factors left out, and the Proto-Negroid element much weakened." This indicates a distribution similar to the balance between the Proto-Australoid and Proto-Negroid types in Australia itself.

TABLE 37. AUSTRALIANS COMPARED WITH VEDDA OF CEYLON

Author Number	Australians	Ceylon			
		Vedda (coast) (Sarasin) 11	Vedda (central) (Sarasin) 14	Vedda (Deschamps) 8	Singhalese (Deschamps) 14
Stature	170	158.8	156.7	157.5	160.51
Sitting height	82	..	..	72.9	77.96
Biacromial diameter	35	..	..	..	35.17
Head length	189(-192)	..	..	189.62	182.71
Head breadth	138(-142)	..	..	137.12	138.78
Minimum frontal diameter	105	..	..	104.25	94.64
Bizygomatic diameter	140	136.4	132.3	120.87	..
Bigonial diameter	105	..	..	105.75	..
Total face height	113	111	105.1	..	..
Nose height	49	..	..	46.07	47.39
Nose breadth	47	40.8	39.4	38.78	35.64
Relative sitting height	49	..	..	46.30	48.60
Relative shoulder breadth	21	..	..	..	21.96 ¹
Cephalic index	73	..	..	72.31	75.95
Fronto-parietal index	76	..	..	76.03 ¹	68.19 ¹
Nasal index	98	..	..	84.18	75.20

¹ Calculated from the means.

It has already been pointed out how frequently parallels have been drawn between the Vedda and the Sakai of Malacca. Outside of the hair form, the grounds for these parallels have been almost entirely impressions derived simply from ocular inspection of these people or of their photographs. One might answer these assertions by retorting that their crania do *not* look much alike. Discrepancies appear between the two groups when one compares measurements of the living Vedda with those of the Sakai, given in Table 34. The Vedda are short, but not so dwarfish as the others, and the difference in head dimensions and index is serious, since a difference of five units in the cephalic index is more considerable than a similar difference in the nasal index. It might be said that the two groups have been each changed from an original common form, by infiltration on one hand from a dolichocephalic, on the other from a brachycephalic stock. However, it is reasonable to demand more

than a likeness in hair form in support of this idea. As matters stand, the Sakai metrically resemble their neighbors the Semang far more than they do the Vedda or the Australians.

Indo-China. The Moi, the wild people of the hills of Indo-China, have been included by some in the postulated pre-Dravidian type, thus linking them with the Sakai and the Vedda, and by implication with the Australians. It is said that among the more remote of these, curly hair, black skins and broad noses are to be found. However, most of them do not display such features, though the data are very poor. They are short of stature and mesocephalic.¹

Ainu. A last Asiatic group which has more than once been mentioned in connection with the Australians is the Ainu of Japan (see Table 36). Both have abundant hair on head, face and body, that on the head being wavy or curly; the Ainu also have a fairly strong development of the brow-ridges. It has been suggested that the Australians derived their hair form from some primitive "Caucasoid" strain in Asia, a hypothesis which the Ainu seem to satisfy.

TABLE 38. AUSTRALIANS COMPARED WITH AINU

Author Number	Australians	Ainu (Montandon) 55	Ainu (Koganei) 91	Japanese (Montandon) 33
Stature.....	170	159.5	156.7	158.1
Head length.....	189(-192)	198.3	193.7	185.5
Head breadth.....	138(-142)	149.5	149.7	150.8
Bizygomatic diameter .	140	142.4	143.8	140.0
Face height.....	113	118.2	124.9	119.2
Nose height.....	49	47.6	55.4	50.4
Nose breadth.....	47	39.3	..	36.7
Cephalic index.....	73	75.5	77.3	81.3
Cephalo-facial index...	95	95.3*	96.1*	92.8*
Facial index.....	81	83.0	86.9	85.4
Nasal index.....	98	83.4	..	73.3

* Calculated from the means.

The head measurements of the Ainu reveal no particular likeness to the Australians, and they are considerably shorter, but there are certain interesting facts. The purer Ainu are largely dolichocephalic, contrasting with almost all their neighbors, and the nasal index is relatively high. However, any hypothesis linking the two peoples on the basis of known facts must be too tenuous to be introduced here, and will therefore be postponed for later discussion.

¹ Holbe, 1923.

Summary of Asia. In Asia, approaches to an Australoid form of man are limited to India, and are most pronounced in the Vedda of Ceylon, these being the only people whose metrical characters show any general correspondence with those of the Australians. In India itself the indications of a deeply submerged Australoid element are found in the character of the hair (which might be explained on other grounds) and the sporadic occurrence of such features as well marked brow-ridges; however, the more primitive (and platyrrhine) peoples seem rather to suggest an ancient Negro strain.

The Dravidians. The term Dravidian is used to denote the darker peoples of southern and eastern India, and is also applied to the language group which covers most of this area, distinct from the encroaching Indo-European tongues of the northwest. The language group, however, does not include the Munda or the Vedda. Probably, then, the aboriginal black-skinned people were not Dravidian-speaking, or else not racially homogeneous, or neither.

As to the Dravidians proper, Hooton's ¹ suggestion is that they arose from an Australoid (or partly Negroid) strain compounded with a White strain, probably of the far-flung Mediterranean type, and not the Aryans of proto-historic times. This is presumably as nearly correct as any theory regarding the question, but the problem of the aboriginals is left unsolved. These in all likelihood consisted of Australoids, Negritos and perhaps Negroids in India, but only of Australoids in Ceylon. Only the Vedda show consistent Australian affinities, yet, tenuous though the evidence is, it is difficult not to believe in an Australoid element for the Dravidians. On the other hand, the Vedda cannot be linked with the Negritos, due to their dolichocephaly; however, the forest tribes in southern India, with their short stature, very curly hair, and facial features, can only be satisfactorily explained by the assumption of a former Negro population.

DISCUSSION OF THE AUSTRALIAN RACE

Theories. Prester John and the Ten Lost Tribes have hardly given rise to opinions more multifarious and romantic than has disputation over the ultimate origin of the Australians. And small

Hooton, 1931, p. 556.

wonder, for, as we have said, they are peculiar people, aberrant from the three major race groups, and confined to one corner of the earth. Their flowing wavy hair has always been the chief actual cause for argument, but equally arresting facts are the above-mentioned isolation and their undeniably primitive morphology. It is to be hoped that the reader of the ensuing essay will bear in mind that much of what sounds like assertion is only suggestion. Let us first list and briefly discuss some of the theories which have been offered, classified according to the principal idea behind each.

- I. Australia represents the home of mankind.
- II. The Australians are descended from Neanderthal man.
- III. They are the living representatives of an early *Homo sapiens* stage.
- IV. They are the product of mixture between:
 - (a) a "White" and a Negrito or Negro stock,
 - (b) two differing Negroid strains,
 - (c) Tasmanian and Polynesian.

I. The notion that Australia represents the original breeding ground of *Homo sapiens*, and that only the Australian clung to both his home and his somatic heritage, while the progenitors of other races changed color and wandered away, generally involves the belief in a lost continent. Basedow,¹ for example, suggests that man originated in Gondwanaland, which included South Africa, India and Australia. Migrating groups from the main stock became Whites, Negroes and Mongoloids. Then the land broke up, and the congenial climate of Australia impelled in the isolated Australians no evolutionary progress from their primitive state. However, the best authority indicates that Gondwanaland had disintegrated before the beginning of the Tertiary period. For the disappearing continent Schoetensack² substitutes the rising and falling of parts of the Indonesian land-bridge. Primitive man (and the dingo) came from Asia to Australia, where modern racial types began to bud from the common stock, escaping back to Asia when the land-bridge valve permitted it. But it is excessively difficult to see how a stock which has remained so conservative in Australia, and which is today so homogeneous and morphologically isolated,

¹ Basedow, 1925.

² Schoetensack, 1901.

could have been the fertile fountain-head from which sprang the diverse racial forms of today.

II. Aside from the opinions of those who, like Hrdlička, believe that *Homo sapiens* is derived directly from *Homo neanderthalensis*, the suggestion was formerly made (once by W. J. Sollas¹) that the Australians alone were the descendants of the Neanderthals. This thesis rests upon the brow-ridge development in particular and the unrefined facial aspect in general. However, it is more reasonable to suppose that if the Australians are of Neanderthal descent, so are other modern races, since the Australians share all those characteristics of *Homo sapiens* which are generally accepted as separating them from other species. Examples are (a) brow-ridges which are typically not true tori, but divisible into separate elements; (b) canine fossae; (c) a mental eminence. To which may be added the fact that the Australian vault, in spite of its length and lowness, is different in character from that of the Neanderthal in its keel, its plane surfaces and its lack of breadth. Remark also the Neanderthal specializations of bowed limbs and taurodont teeth, which to most students definitely remove the type from the antecedent line of modern man.

III. The belief that the Australian is a survivor, not of Neanderthal man, but of one of the early forms of modern man, is well expressed by Keith, its principal proponent:²

"In this continent (Australia) has come down to us, much changed by specialization of a superficial nature, mammals which are really living fossils, representatives of a very ancient stage in mammalian evolution. In the same way this continent has preserved for us a very ancient type of man. It is true the jaws of this ancient type have grown smaller in his descendants, but they have kept his essential characteristics. More than any other man, the aborigine of Australia and Tasmania seems to have conserved the qualities of the stock which gave rise to all modern breeds. We may look upon him as the best living representative of Pleistocene man."

This belief rests specifically on the Australoid Wadjak and Talgai skulls, which appear to be fairly ancient, particularly the latter. To Keith's mind the modern Australian has changed to a slight

¹ Sollas, 1911. Von Luschán was an adherent of this theory, according to Hooton, who talked with him on the subject.

² Keith, 1925, p. 456.

70 ANTHROPOMETRY OF THE NATIVES OF ARNHAM LAND

degree from the Talgai type, especially in the palate, but still remains essentially what he was upon his Pleistocene hejira.

It might be mentioned that this theory is more or less concurred in by Hrdlička,¹ although he more specifically relates the Australian to an archaic White stock of Europe, supposedly of a late Mousterian or Aurignacian age, which somehow managed to reach Australia.

IV. Almost all other types of theory regard the Australian not as a pure race but as a thorough blend of other strains, a process which may have taken place either on the mainland or in Australia. The general objections to such theories are two: first, the Australians are extremely homogeneous throughout the continent, in spite of former notions to the contrary; and second, there is no modern or "neanthropic" racial type which might be the parent of such backward beings.

(a) A hypothesis advanced principally by Hooton,² and also by Howitt³ and Giglioli,⁴ explains the Australian as the mixture of an aboriginal frizzly-haired Melanesian and a primitive Caucasoid strain. In each case the Melanesian is represented by the Tasmanian, whom Hooton takes to be the earliest Melanesian, and Howitt, following Turner, as a Negrito derivative. Hooton² says:

"The reason for thinking that the Australians are fundamentally 'White' is that when we get into the central and southern part of the continent, the hair of the Australian is usually wavy rather than curly and never woolly or frizzly." Also light hair and eyes⁵ have been reported. (This blondness of the hair, found particularly in children, might be considered expressive of a "White" ancestor; however, such an ancestor would himself have to be a true blond, a type which in the Caucasoid family is not generally believed to be archaic or fundamental. Other suggestions may be offered,⁶ but the actual significance of the phenomenon must await full investigation.)

This theory has much to recommend it, though it rests primarily on that stumbling-block, the hair form. Hooton⁷ believes that certain characters of the Ainu such as heavy brow-ridges and de-

¹ Hrdlička, 1926.

² Hooton, 1931, p. 552.

³ Howitt, 1904.

⁴ See Howitt, 1904, p. 4.

⁵ The author has found only one case of light eyes, that described by Basedow (1925, p. 25).

⁶ For particulars concerning blondism, see p. 38.

⁷ Hooton, 1931, p. 539.

pressed nasal root, as well as hairiness, are at least symptomatic of the postulated White stock. On the whole, however, the cranial resemblances of the Ainu to the Australian are not perceptibly greater than those of common European types, the divergences of the Ainu from the latter being rather in a Mongoloid direction.

(b) The Australian has been extensively explained as an amalgam of two different Negroid groups, which are variously described. Topinard, as has already been set forth, and also Mathew, supposed that a tall straight-haired group had conquered and fused with a small, exceedingly inferior woolly-haired people much like the Tasmanians. As we have seen, the heterogeneity of type on which Topinard based his hypothesis had been much exaggerated. Dixon¹ held that Australia was first populated, together with much of the western Pacific, by an old wave of Australoid peoples carrying a substratum of the Negrito type. This lasted in a pure form only in Tasmania, the Australians being modified, especially in the north, by a later Negroid invasion. Two facts, however, are to be noted: the curliest hair occurs both in Tasmania and in the north, which are the regions supposedly most strongly contrasted in type; and from the manner in which Dixon's cranial types were constituted, the moderate difference in head height which actually exists affects his mathematical analysis very strongly.

(c) A suggestion of Sergi² derives our subjects from Polynesian seepage into Australia, then occupied by the Tasmanians, who are taken to be a pure, ancient and wide-spread Oceanic and American aborigine. The essential portion of the theory is not as futile as it seems, considering the dolichocephaly and beardedness of the early Polynesians. It is somewhat like the suggestion of Caucasoid admixture already presented. However, there is a general dissimilarity in cranial characters between Polynesians and Australians, and if physical grounds fail us, a cultural rebuttal will suffice.

The Australians an Early Form of Homo Sapiens. The theory to which we are led by the present body of evidence is more or less the one which Keith suggested. *The Australian is not a blend but a major race, and is the most archaic race still surviving.* He probably presents with considerable fidelity the morphological stage attained by Homo sapiens in Asia at that remote time when he wandered out into the Pacific and isolation. He may have undergone

¹ Dixon, 1923, p. 375.

² Sergi, 1913.

some minor changes, but he is intrinsically what he was when he left the evolutionary crucible on the Asiatic mainland which has since given off the specialized (superficially) Negroid and Mongoloid and the unspecialized White and American Indian.

The modern concept underlying the emergence of man is that of a progressive central stock of Primates which in Tertiary history has repeatedly divided, one division losing its upward momentum and tending to become highly adapted, the other remaining conservative in its adaptations, but retaining its potential adaptive powers to a high degree.¹ The specialized branch may have an interesting subsequent history and, according to the principle of orthogenesis, even parallel the evolution of the other for a certain distance. But in morphological development it ultimately falls far behind the more moderate branch, which is already throwing off specialized groups of a more advanced type. Thus the animal kingdom is overrun with forms which, although specialized in many ways, still represent a stage which was once the highest which their family or order had attained. The generalized stem, then, has pursued a fairly direct highway, avoiding seductive but confining byways of development, though at the same time passing within the borders of certain morphological "areas" which are now the provinces of those stocks which did follow a byway.

These conceptions, however, have only recently been applied to the Hominidae, which is the fault of the now completely discarded attempt to fit all fossil humanoid forms into the direct lineage of *Homo sapiens*. The lessons of Primate history make it seem probable that, instead of producing them more or less simultaneously, the human stock gave off the original forms of the several racial stocks as it progressed near to or actually through the types or stages which they represent. (It must always be remembered, of course, that these racial stocks have had independent histories of considerable duration.) Let us therefore examine the reasons for believing that, of the surviving races of man, the Australian is the oldest, and the Negro group, together with the Negrito, probably the second oldest.

Proceeding inductively, we may postulate some of the characters

¹ For a treatment of Primate evolution see Le Gros Clark, 1934, "Early Forerunners of Man"; 1935, "Man's Place among the Primates." See also Montandon, 1928, "L'origine Humaine."

of the immediate and direct progenitor of *Homo sapiens*, from the collective evidence of fossil types and of the Primate family in general. This is not difficult. Our ancestor was probably long-headed, with a low forehead and larger brow-ridges than at present; he was likewise more prognathous, with a larger palate and teeth and a smaller chin. Of his external characters we must ignore the color of his skin and say of his nose only that the root was probably low and broad. His hair was probably plentiful on his body, and, most important of all, was probably slightly wavy. At any rate, it was certainly not woolly, and most probably was not lankly straight like that of the highest Malays and Chinese, for no Primate hair can be strictly compared with either of these forms.

Here, then, is a reasonable picture of the proto-modern human stock. It is merely redundant to point out how much nearer such a type the Australian stands than does any other race, or to remember how convenient an adjective the word "Australoid" has become to express a primitive morphology. Furthermore the explanation of the hair form in Australia becomes a simple matter: the wavy hair does not result from the modification of a woolly-haired black people by a straighter-haired group, but has been retained from an ancestral form existing before woolly hair had ever appeared.

Specializations peculiar to the Australians, away from the ancestral form, are rather harder to divine. They possibly include the development of the deep pigmentation, affecting even the sclera of the eye, though we have no fossil skin color to give us proper information. Other characters of this sort might be the bulbous nasal tip and the keel of the skull vault, though this is very doubtful. A final suggestion is that the short face is a special character, though it more probably represents a definite stage in facial evolution.

The direct evidence of the antiquity and persistence of the Australian type rests almost entirely on the Talgai skull, but partly also upon those from Cohuna, and from Wadjak in Java. Archaeological data are meager. Keith¹ considers the Wadjak crania, said to be of Pleistocene age by their discoverer Dubois, already to have outstripped the Australians in their development, judging by the cranial capacity, though in most respects they are Australoid in type. The skull from Talgai, Queensland, is Pleistocene, perhaps

¹ See Keith, 1925-1931.

mid-Pleistocene. This too is definitely Australian in type, though Keith, from the shape and size of the palate, infers that it is rather more primitive still, and should be taken as the immediate proto-type of the race. There has been much uncertainty, however, regarding the palate, due to the crushed state of the specimen. Hellman¹ has recently made a new and extremely careful restoration which removes the ape-like characters of the arch and presents a primitive generalized human form which recurs in a percentage of present-day Australians. As the arch had been the main point of difference between the Talgai man and the modern type, the fossil evidence becomes more amenable to the idea of the long existence of the Australians in Australia, undergoing relatively slight changes. As for the Cohuna skull, this appears to be of the same proto-Australoid type, and its remarkable prognathism and large teeth lead Keith to consider it as an extremely primitive type, and to infer that the Australians have traversed a long road of development in their own continent. But little information has been made available concerning the Cohuna skull, however, and the circumstances of its finding gave no direct evidence of great antiquity except for mineralization and morphology; it was revealed at a shallow depth, without accompanying artifacts or animal remains, and parts of other human skeletons found near it indicated that all these individuals had been buried.

It may be well to extend the discussion to include the probability that the Negro was the next racial stem to undertake its independent development, since one might argue that instead of continuing on with the main stock after the Australian had parted from it, the Negro evolved directly from the Australian. Besides citing the black skin and prognathism common to both,² one might point out that Australoid-looking crania appear most frequently among the Negroes; however, such crania are certainly not unknown among Whites and American Indians, and seem merely to echo the one-time Australoid stage of *Homo sapiens*. And there are strong arguments favoring the opposite view. The Negro still has his prognathism, as have some types of American Indian, but in common with other races he seems to have lost the big brow-ridges and de-

¹ Hellman, 1934.

² Other evidence of racial proximity of the Negroes to the Australians is to be found in the general correspondence in body and head measurements of the latter with those of African Negroes (West Africa).

veloped more of a forehead, which in many Negroes is actually bulging. And if the black skin and the prognathism are traits derived from Australian ancestry, then so might be the hairiness and the well-marked brow-ridges of the White stock.

The Negritos are probably the best evidence against the derivation of the Negroes directly from the Australians. They are obviously members of the Negro family who appeared only after most of the Negro specializations had been established. Their only definite difference from the Negro proper lies in their stature, since their tendency toward brachycephaly is frequently supposed to be a function of their shortness. Thus, while they in many ways represent a refinement or exaggeration of the Negro type, at the same time they contrast strikingly with the Australian, although they still retain the black skin and the prognathism. As to black skin itself, this is a question which is likely to remain long unsolved. Possibly the early forms of *Homo sapiens* were as densely pigmented as the Australian and the Negro, the latest types becoming progressively lighter.

The Tasmanians. Before summarizing the probable history of the Australians, let us turn to the question of the Tasmanians, who have been as variously accounted for as the former. Their geographical position and the fact of their being extinct furnish the elements of a perplexing problem. They differed from the Australians in having woolly hair, worn in short ringlets, and slightly shorter, broader heads. The fact that they were marginal in position even to the Australians has doubtless been largely responsible for theories that the Australians were of mixed racial origin, the Tasmanians being one, and the oldest, constituent. Hooton suggests that the latter are the earliest form of Melanesian Negro; Turner believed them to be originally a branch of the Negrito. However, their actual differences from the Australians are slight. Their hair appears not to have been strongly woolly, although Friedenthal¹ found from microscopic examination of a few hairs that it was comparable to that of typically woolly or frizzly-haired groups. Nothing of a Negritoid character is present in the cranium, though the shorter vault is obvious; aside from this every feature is quite Australoid. Morant, using the figures of other writers, found marked differences in the measurements of the palate, etcetera.

¹ Friedenthal, 1913.

However, these differences vanish, excepting in the vault diameters, in the measurements of Hrdlička, whose standing as a technician needs no testimonial. Therefore, it seems judicious to accept the Tasmanians as an Australian population which has been modified, in part at least, by an incursion of woolly-haired Melanesians from the east which, if it ever arrived in Australia, was there too much diffused to have a visible effect.¹ Certainly it is more rational to suppose that the Tasmanians are the result of the action of some Melanesian influence (which is geographically available) in a small area, than to believe that the entire Australian population has been affected by the impact of a primitive Caucasoid type, now not found within thousands of miles, upon an earlier Tasmanoid stratum.

The Migrations of the Australians. Only four groups of people in the whole area which has been investigated give satisfactory physical evidence of a probable relationship with the Australians: these are found in Tasmania, New Caledonia, Northern New Britain and Ceylon. The evidence is weakest in the case of the last-named. Indications, but not evidence, exist to put other groups in the same class; these are some of the Dravidians and people of the Lesser Sunda Islands. Such indications may some day also be found in New Guinea. However, it seems clear that such people as the Sakai are not of this group.

The first home of the Australians was perhaps southern Asia. The type reached Australia and Tasmania from either Timor or New Guinea, or both, at a very early time, as the Talgai skull seems to show. It also managed to get to New Britain, New Ireland and New Caledonia, so that it must have been present in New Guinea. In other words, the type seems to have managed to reach the margins of the area of great land masses in the Pacific. The Australoids also either evolved in or spread through southern India and into Ceylon. It is most likely that all of these movements took place, not under the pressure of other peoples, but by an ancient and slow drift.

The chronological and evolutionary relationships of the Negritos are far from settled. However, all the evidence makes it appear that they spread through Southeast Asia and Oceania only

¹ A somewhat parallel instance is afforded by Madagascar; the strong Oceanic influences which have affected this island are nowhere apparent on the mainland of Africa.

after the Australoids had gone before, since the presence of Negritos or near-Negritos in several areas along the line of march through New Guinea, as they are at present found, would have constituted a serious deterrent to an Australoid migration which was probably not very populous or purposeful. The Negritos reached New Guinea, but not Australia, just as they appear to have spread through the South Indian forests without reaching Ceylon. As a matter of opinion, it is probable that there was a long lapse of time between the coming into the Pacific of the Australoids and that of the Negritos and Negroids. There seems to be no doubt from the circumstances that, as between the last two, the Negritos came first.

One last hypothesis is hesitantly offered to explain the extinction of the Australian in almost every realm but his own. He seems to have an inherently low potential for survival, and he has populated his own continent only extremely sparsely, even allowing for adversities of climate. Nor does his culture-level permit him the luxury of a large population. If this condition has always existed, and it probably has, it seems clear that in Indonesia and New Guinea there was not a great enough mass of the Australoid type to offer an obstacle to later invasions, even of the lowly Negrito, or to dominate, as a type, in many cases of mixture. Only in the marginal locations, the Bismarck Archipelago, Northern New Caledonia and Tasmania, due to some fortuitous circumstance or other, have the Australoids survived as an important element in mixtures with the later Negroids. As to Ceylon, the Australoid Vedda have been modified by some other strain, possibly the same White stock which is present in the Dravidians.

Summary

1. The Australians, characterized by a uniformly primitive morphology throughout the head and cranium, are, considering the area over which they are extended, remarkably homogeneous in physical type. Admixtures of Melanesian blood, which must have taken place in the north, have had little effect.

2. The Australians are a major race which represents an earlier stage in the development of *Homo sapiens* than does any other existing race. It has been preserved, with its primitive features,

through stagnation and isolation; its characteristic wavy hair is probably older than the woolly hair of the Negro.

3. Representatives of the Australoid race, mixed with other strains, are to be found in Tasmania, New Caledonia, the Bismarck Archipelago and Ceylon, and possibly also in Southern India and some of the Lesser Sunda Islands. The Sakai and Toala, however, are not related to the type, being rather of Negrito derivation.

4. The Australoid type originated on the Asiatic continent, perhaps in India, and spread into the Western Pacific as the first representative of modern man, probably at a very remote period. Outside of Australia, the Australoids have been extinguished or submerged everywhere except in a few marginal regions.

APPENDIX I

As this paper was in the final stages of printing, there appeared in Oceania, Vol. 7, no. 1, a paper by T. D. Campbell, J. H. Gray, and C. J. Hackett, entitled "Physical anthropology of the aborigines of Central Australia," with a series of nearly 200 males from a number of stations in this area. The means given below are those of two age groups.

	Age 26-45 (c. 95)	Age 45-X (c. 85)
Stature	168.66	167.26
Head length	195.60	194.74
Head breadth	140.05	141.72
Minimum frontal diameter	104.06	104.58
Bizygomatic diameter	139.38	141.54
Bigonial diameter	102.61	102.12
Face height	113.96	114.55
Nose height	49.47	51.29
Nose breadth	48.39	49.95
Cephalic index	71.6	72.79
Nasal index	97.8	97.4

These means fall throughout within the ranges of those in Table 25, although the head length seems greater in this region than the other figures indicate, allying the area more closely with the southern portion. The probability that the nose is somewhat higher in Central Australia seems to be corroborated.

APPENDIX II

TABLE 1. AUSTRALIAN MALES

NORTHWEST ARNHEM LAND

	No.	Range	Mean	S.D.	V.
Height.....	98	155-187	169.62±.40	5.94±.29	3.50±.17
Weight.....	99	81-180	121.40±1.02	15.10±.72	12.44±.60
Biacromial diameter	99	28-42	35.14±.16	2.31±.11	6.44±.31
Sitting height.....	98	72-92	82.02±.22	3.30±.16	3.98±.19
Chest depth.....	99	16-27	19.08±.12	1.82±.09	9.54±.46
Chest breadth.....	99	20-40	24.45±.16	2.34±.11	9.57±.46
Total hand length..	98	168-211	188.70±.56	8.16±.39	4.32±.21
Hand length.....	98	89-121	106.56±.37	5.40±.26	5.07±.24
Hand breadth.....	98	69-95	82.48±.31	4.56±.22	5.53±.27
Head length.....	99	173-205	188.97±.53	7.83±.38	4.14±.20
Head breadth.....	99	126-152	138.01±.35	5.10±.24	3.70±.18
Head height.....	89	113-139	126.36±.38	5.34±.27	4.23±.21
Head circumference.	97	478-597	530.90±1.17	17.04±.82	3.21±.16
Min. frontal diameter	95	93-116	104.78±.35	5.12±.25	4.89±.24
Bizygomatic diameter	98	130-154	139.75±.33	4.90±.24	3.51±.17
Bigonial diameter..	98	90-121	105.26±.40	5.80±.28	5.51±.27
Total face height..	96	95-129	113.05±.49	7.10±.35	6.28±.31
Upper face height..	96	50-74	64.60±.34	4.90±.24	7.58±.37
Nose height.....	98	32-67	48.54±.32	4.64±.22	9.56±.46
Nose breadth.....	99	31-57	46.88±.26	3.78±.18	8.06±.39
Ear length.....	98	36-79	64.22±.34	5.00±.24	7.79±.38
Ear breadth.....	99	29-46	35.94±.18	2.70±.13	7.51±.36
Relative shoulder br.	98	18-25	21.26±.09	1.38±.07	6.49±.31
Relative sitting height	97	44-55	48.96±.12	1.74±.08	3.55±.17
Hand index.....	98	36-51	43.84±.16	2.40±.12	5.47±.26
Cephalic index.....	99	65-82	72.96±.20	2.88±.14	3.95±.19
Length-height index	89	58-75	67.01±.23	3.18±.16	4.75±.24
Breadth-height index	89	73-102	91.25±.34	4.83±.24	5.29±.27
Fronto-parietal index	95	69-86	75.97±.24	3.48±.17	4.58±.22
Cephalo-facial index	98	82-111	95.15±.25	3.72±.18	3.91±.19
Zygo-frontal index..	94	68-83	75.02±.23	3.36±.16	4.48±.22
Fronto-gonial index.	94	85-119	100.85±.44	6.35±.31	6.30±.31
Zygo-gonial index..	97	63-83	75.37±.27	3.90±.19	5.17±.25
Facial index.....	95	70-97	80.98±.35	5.04±.25	6.22±.30
Upper facial index..	95	37-57	46.37±.28	4.08±.20	8.80±.43
Nasal index.....	98	76-127	98.06±.66	9.68±.47	9.87±.48
Ear index.....	98	45-68	56.06±.33	4.80±.23	8.56±.41

82 ANTHROPOMETRY OF THE NATIVES OF ARNHAM LAND

TABLE 2. AUSTRALIAN MALES

VICTORIA RIVER						
	No.	Range	Mean	S.D.	V.	
Height.....	28	155-181	169.29±.78	6.09±.55	3.60±.32	
Weight.....	28	91-170	125.90±2.09	16.40±1.48	13.03±1.17	
Biacromial diameter	28	31-42	35.96±.29	2.28±.20	6.34±.57	
Sitting height.....	28	75-89	82.12±.46	3.63±.33	4.42±.40	
Chest depth.....	28	14-21	17.72±.23	1.80±.16	10.16±.92	
Chest breadth.....	28	17-28	23.46±.25	1.98±.18	8.44±.76	
Total hand length..	28	164-203	184.94±1.15	9.00±.81	4.87±.44	
Hand length.....	28	92-115	104.88±.64	5.04±.45	4.80±.43	
Hand breadth.....	28	69-95	81.04±.67	5.28±.48	6.52±.59	
Head length.....	27	176-202	188.79±.75	5.82±.53	3.08±.28	
Head breadth.....	27	126-146	138.88±.63	4.86±.45	3.50±.32	
Head height.....	27	113-142	126.12±.79	6.12±.56	4.85±.44	
Head circumference	28	502-573	537.50±1.67	13.08±1.18	2.43±.22	
Min. frontal diam..	28	93-120	104.50±.71	5.60±.50	5.36±.48	
Bizygomatic diam..	28	125-149	137.90±.61	4.80±.43	3.48±.31	
Bigonial diameter..	28	90-113	101.66±.90	7.02±.63	6.90±.62	
Total face height..	27	100-129	113.65±.81	6.25±.57	5.50±.50	
Upper face height..	27	55-74	65.50±.61	4.70±.43	7.18±.66	
Nose height.....	28	32-59	48.22±.61	4.80±.43	9.95±.90	
Nose breadth.....	27	34-60	47.12±.56	4.35±.49	9.23±.85	
Ear length.....	28	44-75	63.06±.62	4.84±.44	7.68±.69	
Ear breadth.....	28	29-43	35.46±.37	2.88±.26	8.12±.73	
Relative shoulder br.	28	18-25	21.22±.19	1.52±.14	7.16±.64	
Relative sitting ht.	28	44-51	48.64±.21	1.68±.15	3.45±.31	
Hand index.....	28	38-51	44.14±.35	2.78±.25	6.30±.57	
Cephalic index....	26	62-82	73.50±.47	3.54±.33	4.82±.45	
Length-height index	26	58-75	67.07±.49	3.69±.34	5.50±.51	
Breadth-height ind.	25	82-99	90.92±.60	4.47±.43	4.92±.47	
Fronto-parietal ind.	27	66-83	75.01±.36	3.54±.32	4.72±.43	
Cephalo-facial index	27	85-111	93.11±.57	4.41±.40	4.74±.44	
Zygo-frontal index	28	64-87	75.22±.53	4.20±.38	5.58±.50	
Fronto-gonial index	28	85-109	97.00±.75	5.85±.53	6.03±.54	
Zygo-gonial index..	28	66-80	73.63±.45	3.54±.32	4.81±.43	
Facial index.....	27	74-93	82.30±.61	4.72±.43	5.74±.53	
Upper facial index	27	40-60	48.32±.50	3.87±.36	8.01±.74	
Nasal index.....	27	84-115	98.54±1.03	7.96±.73	7.47±.69	
Ear index.....	28	45-80	56.50±.84	6.56±.59	11.61±1.05	

TABLE 3. AUSTRALIAN MALES

MELVILLE AND BATHURST ISLANDS

	No.	Range	Mean	S.D.	V.
Height.....	28	155-175	166.83±.58	4.56±.41	2.73±.25
Weight.....	28	91-160	125.50±1.86	14.60±1.32	11.63±1.05
Biacromial diameter	28	31-42	36.62±.24	1.86±.17	5.08±.46
Sitting height.....	28	78-92	83.08±.38	2.94±.26	3.54±.32
Chest depth.....	27	16-21	18.64±.14	1.10±.01	5.90±.54
Chest breadth.....	27	23-28	24.90±.18	1.38±.13	5.54±.51
Total hand length.....	28	168-195	183.66±.92	7.20±.65	3.92±.35
Hand length.....	28	95-112	104.88±.50	3.90±.35	3.72±.33
Hand breadth.....	28	72-92	81.04±.55	4.32±.39	5.33±.48
Head length.....	27	179-205	192.90±.84	6.48±.59	3.36±.31
Head breadth.....	27	129-146	136.00±.54	4.17±.38	3.07±.28
Head height.....	27	119-136	126.00±.49	3.75±.34	2.98±.27
Head circumference	28	502-573	539.66±2.20	17.28±1.56	3.20±.29
Min. frontal diam..	28	89-112	105.22±.65	5.12±.46	4.87±.44
Bizygomatic diam..	28	130-159	142.70±.69	5.45±.49	3.82±.34
Bigonial diameter..	28	94-117	106.34±.73	5.76±.52	5.42±.49
Total face height	28	95-129	110.20±.90	7.10±.64	6.44±.58
Upper face height..	28	50-74	61.45±.57	4.50±.41	7.32±.66
Nose height.....	28	36-59	45.34±.48	3.76±.34	8.29±.75
Nose breadth.....	27	40-57	47.33±.48	3.69±.34	7.80±.72
Ear length.....	28	52-75	62.66±.58	4.52±.41	7.21±.65
Ear breadth.....	28	32-43	35.79±.29	2.28±.21	6.37±.57
Relative shoulder br.	28	20-23	22.08±.07	0.82±.07	3.71±.33
Relative sitting ht..	28	46-53	49.64±.20	1.56±.14	3.14±.28
Hand index.....	28	42-49	44.36±.17	1.32±.12	2.98±.27
Cephalic index.....	26	65-76	70.50±.30	2.25±.21	3.19±.30
Length-height index	26	61-72	65.24±.31	2.34±.22	3.59±.34
Breadth-height index	26	85-99	92.81±.37	2.82±.26	3.04±.28
Fronto-parietal ind.	27	69-83	77.56±.37	2.85±.26	4.06±.34
Cephalo-facial index	27	91-114	98.54±.67	5.19±.48	5.27±.48
Zygo-frontal index	28	68-83	73.94±.40	3.12±.28	4.22±.38
Fronto-gonial index	28	85-114	100.95±.65	5.10±.46	5.05±.46
Zygo-gonial index..	28	66-83	75.37±.39	3.06±.28	4.06±.37
Facial index.....	28	70-89	77.66±.60	4.72±.42	6.08±.55
Upper facial index..	28	37-48	43.79±.31	2.40±.22	5.48±.49
Nasal index.....	27	80-127	103.58±1.43	11.00±1.01	10.62±.97
Ear index.....	28	45-68	57.50±.72	5.64±.51	9.81±.88

84 ANTHROPOMETRY OF THE NATIVES OF ARNHAM LAND

TABLE 4. AUSTRALIAN MALES

NORTHEAST ARNHAM LAND						
	No.	Range	Mean	S.D.	V.	
Height.....	77	155-178	166.98±.43	5.64±.31	3.38±.18	
Weight.....	4	111-140	123.00±2.80	8.30±1.98	6.75±1.61	
Biacromial diameter	77	28-39	34.64±.13	1.74±.09	5.02±.27	
Sitting height.....	77	75-89	82.03±.24	3.15±.17	3.84±.21	
Chest depth.....	76	16-21	18.84±.08	1.04±.06	5.52±.30	
Chest breadth.....	76	20-31	23.40±.12	1.62±.09	6.92±.38	
Total hand length	76	164-207	182.82±.61	7.92±.43	4.33±.24	
Hand length.....	77	92-118	102.60±.37	4.80±.26	4.68±.25	
Hand breadth.....	77	69-89	79.90±.33	4.26±.23	5.33±.29	
Head length.....	77	179-211	190.14±.37	4.83±.26	2.54±.14	
Head breadth.....	77	123-146	134.02±.71	4.50±.24	3.36±.18	
Head height.....	76	98-133	120.30±.42	5.49±.30	4.56±.25	
Head circumference	77	478-573	529.10±1.11	14.40±.78	2.72±.15	
Min. frontal diam. .	77	93-120	104.62±.35	4.60±.25	4.40±.24	
Bizygomatic diameter	77	120-154	139.25±.40	5.20±.28	3.73±.20	
Bigonial diameter .	77	94-117	103.46±.41	5.32±.29	5.14±.28	
Total face height...	77	95-124	109.80±.45	5.90±.32	5.37±.29	
Upper face height .	77	50-74	62.15±.36	4.70±.26	7.56±.41	
Nose height.....	76	40-59	46.54±.27	3.52±.19	7.56±.41	
Nose breadth.....	76	40-57	47.48±.26	3.30±.18	6.95±.38	
Ear length.....	76	52-75	63.30±.29	3.68±.20	5.81±.32	
Ear breadth.....	76	29-46	35.76±.19	2.52±.14	7.05±.39	
Relative shoulder br.	77	18-23	20.70±.06	0.82±.04	3.96±.21	
Relative sitting height	77	44-53	49.28±.13	1.68±.09	3.41±.18	
Hand index.....	76	36-47	43.58±.14	1.84±.10	4.22±.23	
Cephalic index . . .	77	65-76	70.35±.22	2.85±.15	4.05±.22	
Length-height index	76	55-72	63.23±.25	3.27±.18	5.26±.29	
Breadth-height index	76	79-99	89.78±.28	3.63±.20	4.04±.22	
Fronto-parietal index	77	60-92	77.47±.34	4.41±.24	5.69±.31	
Cephalo-facial index	77	88-111	98.03±.33	4.26±.23	4.35±.24	
Zygo-frontal index .	77	68-87	75.22±.20	3.64±.20	4.84±.26	
Fronto-gonial index	77	85-114	99.00±.48	6.20±.34	6.26±.34	
Zygo-gonial index	77	60-86	74.26±.31	4.08±.22	5.49±.30	
Facial index.....	77	70-93	79.48±.36	4.72±.26	5.94±.32	
Upper facial index .	77	34-51	44.63±.27	3.48±.19	7.80±.42	
Nasal index.....	76	80-131	103.90±.78	10.12±.55	9.74±.53	
Ear index.....	76	45-68	56.54±.31	4.04±.22	7.14±.39	

TABLE 5. AUSTRALIAN MALES

ROPER RIVER

	No.	Range	Mean
Height	8	152-178	166.50
Weight	8	101-180	130.50
Biacromial diameter .	8	34-39	36.50
Sitting height	7	78-86	82.00
Chest depth	8	16-23	19.00
Chest breadth	8	23-28	24.36
Total hand length . .	8	176-203	186.62
Hand length	8	98-112	106.86
Hand breadth	8	78-95	83.86
Head length	8	182-205	193.86
Head breadth	8	120-146	137.14
Head height	7	116-142	127.71
Head circumference	8	502-561	542.06
Min. frontal diam.	7	97-116	108.78
Bizygomatic diameter	8	135-154	143.25
Bigonial diameter . .	8	98-117	107.50
Total face height . .	8	105-124	113.25
Upper face height . .	8	55-74	63.90
Nose height	8	40-55	45.50
Nose breadth	8	40-54	47.36
Ear length	8	56-71	64.50
Ear breadth	8	29-40	35.25
Relative shoulder br.	8	20-23	21.50
Relative sitting ht.	7	46-53	49.36
Hand index	8	42-47	44.00
Cephalic index	8	62-76	70.14
Length-height index	7	61-75	66.29
Breadth-height index	7	88-99	93.29
Fronto-parietal index	7	69-86	78.58
Cephalo-facial index	8	91-117	100.64
Zygo-frontal index	7	72-83	79.22
Fronto-gonial index	7	85-104	97.00
Zygo-gonial index	8	72-77	74.14
Facial index	8	74-85	78.50
Upper facial index . .	8	40-51	46.25
Nasal index	8	84-115	101.50
Ear index	8	49-68	56.50

86 ANTHROPOMETRY OF THE NATIVES OF ARNHEM LAND

TABLE 6. AUSTRALIAN MALES

TOTAL SERIES					
	No.	Range	Mean	S.D.	V.
Height.....	239	152-187	168.30±.26	5.94±.18	3.53±.11
Weight.....	167	81-180	123.30±.82	15.70±.58	12.73±.47
Biacromial diameter	240	28-42	35.60±.09	2.16±.07	6.07±.19
Sitting height.....	238	72-92	82.57±.14	3.24±.10	3.92±.12
Chest depth.....	238	14-27	18.80±.07	1.58±.05	8.40±.26
Chest breadth.....	238	17-40	24.06±.09	2.01±.06	8.35±.26
Total hand length..	238	164-211	185.82±.37	8.48±.37	4.56±.14
Hand length.....	239	89-121	104.91±.23	5.28±.16	5.03±.16
Hand breadth.....	239	69-95	81.37±.20	4.68±.14	5.75±.18
Head length.....	238	173-211	189.93±.27	6.30±.19	3.32±.10
Head breadth.....	238	120-152	136.54±.23	5.25±.16	3.84±.12
Head height.....	226	98-142	124.29±.27	6.09±.19	4.90±.15
Head circumference	238	478-597	532.46±.71	16.32±.50	3.06±.09
Min. frontal diameter	235	89-120	104.82±.22	5.08±.16	4.85±.15
Bizygomatic diameter	239	120-159	139.85±.23	5.30±.16	3.79±.12
Bigonial diameter..	239	90-121	104.46±.25	5.84±.18	5.59±.17
Total face height..	236	95-129	111.70±.30	6.80±.21	6.09±.19
Upper face height..	236	50-74	63.50±.22	4.95±.15	7.80±.24
Nose height.....	238	32-67	47.38±.19	4.36±.13	9.20±.28
Nose breadth.....	237	31-60	47.15±.16	3.72±.11	7.89±.24
Ear length.....	238	36-79	63.62±.20	4.56±.14	7.17±.22
Ear breadth.....	239	29-46	35.76±.11	2.58±.08	7.20±.22
Relative shoulder br.	239	18-25	21.18±.05	1.24±.04	5.85±.18
Relative sitting ht...	237	44-55	49.12±.07	1.70±.05	3.46±.11
Hand index.....	238	36-51	43.86±.09	2.18±.07	4.97±.15
Cephalic index....	236	62-82	71.82±.14	3.24±.10	4.51±.14
Length-height index	224	55-75	65.51±.16	3.63±.12	5.54±.18
Breadth-height index	223	73-102	90.95±.20	4.32±.14	4.75±.15
Fronto-parietal index	233	60-92	76.63±.17	3.93±.12	5.13±.16
Cephalo-facial index	237	82-117	96.44±.21	4.80±.15	4.98±.15
Zygo-frontal index..	234	64-87	75.02±.15	3.52±.11	4.69±.15
Fronto-gonial index.	234	85-119	99.80±.28	6.40±.20	6.41±.20
Zygo-gonial index..	238	60-86	74.77±.17	3.81±.12	5.10±.16
Facial index.....	235	70-97	80.14±.22	4.96±.15	6.19±.19
Upper facial index..	235	34-60	45.71±.17	3.93±.12	8.60±.27
Nasal index.....	236	76-131	100.74±.45	10.16±.31	10.08±.31
Ear index.....	238	45-80	56.46±.21	4.92±.15	8.71±.27

TABLE 7. AUSTRALIAN FEMALES

TOTAL SERIES					
	No.	Range	Mean	S.D.	V.
Height.....	69	146-169	157.56±.43	5.34±.31	3.39±.19
Weight.....	56	71-120	95.90±1.01	11.20±.71	11.68±.74
Biacromial diameter	68	25-36	31.88±.17	2.04±.12	6.40±.37
Sitting height.....	69	60-86	76.90±.40	4.92±.28	6.40±.37
Chest depth.....	66	14-21	16.56±.11	1.38±.08	8.33±.49
Chest breadth.....	66	17-25	21.45±.10	1.26±.07	5.85±.34
Total hand length..	68	156-195	174.54±.63	7.76±.45	4.45±.26
Hand length.....	68	86-109	97.11±.37	4.59±.26	4.73±.27
Hand breadth.....	68	66-86	74.50±.21	3.66±.21	4.91±.28
Head length.....	68	164-196	180.18±.52	6.36±.37	3.53±.20
Head breadth.....	65	120-140	130.51±.32	3.84±.23	2.94±.17
Head height.....	65	98-136	121.65±.48	5.70±.34	4.69±.28
Head circumference	68	454-537	506.06±1.15	14.04±.81	2.77±.16
Min. frontal diameter	68	89-120	101.22±.39	4.80±.28	4.74±.27
Bizygomatic diameter	68	120-144	128.55±.35	4.25±.25	3.30±.19
Bigonial diameter..	68	86-109	95.62±.35	4.24±.24	4.43±.26
Total face height...	66	90-114	102.30±.42	5.10±.30	4.98±.29
Upper face height..	66	50-74	59.20±.35	4.25±.25	7.18±.42
Nose height.....	69	32-55	43.94±.30	3.68±.21	8.38±.48
Nose breadth.....	69	34-51	42.05±.25	3.03±.17	7.21±.41
Ear length.....	68	48-75	61.66±.32	3.96±.23	6.42±.37
Ear breadth.....	67	29-40	33.75±.17	2.04±.12	6.04±.35
Relative shoulder br.	68	16-23	20.18±.10	1.22±.07	6.05±.35
Relative sitting ht...	69	40-53	49.00±.17	2.10±.12	4.29±.25
Hand index.....	68	36-49	42.86±.18	2.14±.12	4.99±.29
Cephalic index.....	64	65-82	72.51±.26	3.12±.19	4.30±.26
Length-height index	65	55-78	68.18±.32	3.78±.22	5.54±.33
Breadth-height index	62	82-102	93.41±.31	3.57±.22	3.82±.23
Fronto-parietal index	64	69-86	76.99±.29	3.39±.20	4.40±.26
Cephalo-facial index	64	82-109	92.99±.38	4.47±.27	6.12±.36
Zygo-frontal index..	67	72-91	78.50±.28	3.40±.20	4.33±.25
Fronto-gonial index	67	75-114	94.85±.42	5.10±.30	5.38±.32
Zygo-gonial index..	67	66-86	74.26±.24	2.91±.17	3.92±.23
Facial index.....	65	70-93	79.14±.37	4.40±.26	5.56±.33
Upper facial index..	65	40-57	45.56±.28	3.36±.20	7.37±.44
Nasal index.....	69	80-115	96.38±.66	8.08±.46	8.38±.48
Ear index.....	67	45-68	54.50±.35	4.24±.25	7.78±.45

BIBLIOGRAPHY

ANNANDALE, N., AND ROBINSON, H. C.

1903. Fasciculi Malayensis, Anthropology, part 1. Contributions to the physical anthropology of the Malay Peninsula, pp. 105-175. Liverpool, 1903.

BALNER, L., AND LEBZELTER, V.

1935. Zur Biologie und Anthropologie der Kenja in Nordost Borneo. II Zur Rassenkunde der Kenja. *Anthropos*, vol. 30, parts 3, 4, pp. 495-508. Vienna, 1935.

BASEDOW, H.

1910. Der Tasmanierschadel, ein Insulartypus. *Zeitschrift für Ethnologie*, vol. 42, pp. 175-227. Berlin, 1910.
1925. The Australian aboriginal. 422 pp. Adelaide, 1925.

BERRY, R. J. A., ROBERTSON, A.W.D., AND CROSS, K. S.

1910. A biometrical study of the relative degree of purity of race of the Tasmanian, Australian, and Papuan. *Proceedings of the Royal Society of Edinburgh*, vol. 31, part 1, pp. 17-40. Edinburgh, 1910.

BIJLMER, H. J. T.

1923. Anthropological results of the Dutch Scientific Central New-Guinea Expedition A° 1920, followed by an essay on the anthropology of the Papuans. *Nova Guinea*, vol. 7, part 4, pp. 355-448. Leiden, 1923.
1929. Outlines of the anthropology of the Timor-archipelago. 234 pp. Weltevreden, 1929.

BONDY-HOROWITZ, E.

1930. Beiträge zur Anthropologie von Nordost-Neu-Guinea. *Rudolf Pochs Nachlass, Serie A, Band II*. Vienna, 1930.

BROEK, A. J. P. VAN DEN

1913. Über Pygmaen in Niederländisch-süd-Neu Guinea. *Zeitschrift für Ethnologie*, vol. 45, pp. 23-44. Berlin, 1913.
1923. Zur Anthropologie des Bergstammes Pesechem im Inneren von Niederländisch-Neu-Guinea. *Nova Guinea*, vol. 7, part 2, pp. 234-280. Leiden, 1923.

BURSTON, R.

1913. Records of the anthropometric measurements of 102 Australian aboriginals. *Bulletin of the Northern Territory of Australia*. No. 7. Melbourne, 1913.

90 ANTHROPOMETRY OF THE NATIVES OF ARNHEM LAND

CAMPBELL, T. D., AND HACKETT, C. J.

1927. Adelaide University Field Anthropology: Central Australia. No. 1 — Introduction: descriptive and anthropometric observations. Transactions and Proceedings of the Royal Society of South Australia, vol. 51, pp. 65-75. Adelaide, 1927.

CAMPBELL, T. D., AND LEWIS, A. J.

1926. The aborigines of South Australia: anthropometric, descriptive and other observations recorded at Ooldea. Transactions and Proceedings of the Royal Society of South Australia, vol. 50, pp. 183-191. Adelaide, 1926.

DAVENPORT, C. B.

1925. Notes on physical anthropology of Australian aborigines and black-white hybrids. American Journal of Physical Anthropology, vol. 8, part 1, pp. 73-94. Washington, 1925.

DESCHAMPS, E.

1891. Les Veddas de Ceylon. L'Anthropologie, vol. 2, pp. 297-337. Paris, 1891.

DIXON, R. B.

1923. The racial history of man. 583 pp. New York, 1923.

DUCKWORTH, W. L. H.

1904. Studies from the Anthropological Laboratory, The Anatomy School, Cambridge. 17. A critical study of the collections of crania of aboriginal Australians in the Cambridge University Museum. 291 pp. Cambridge, 1904.
1934. Human remains from rock-shelters and caves in Perak, Pahang and Perlis and from Selinsing. Journal of the Malayan Branch, Royal Asiatic Society, vol. 12, part 2, pp. 149-167. Singapore, 1934.

EICKSTEDT, E. VON

1934. The position of Mysore in India's racial history. The Mysore tribes and castes, vol. 1, chap. 1, pp. 1-80. Bangalore, 1934.

FAWCETT, F.

1900. Notes on some of the people of Malabar. Madras Government Museum Bulletin, vol. 3, part 1, pp. 1-85. Madras, 1900.

FRIEDERICI, G.

1912. Wissenschaftliche Ergebnisse einer amtliche Forschungsreise nach dem Bismark-Archipel im Jahre 1908. II. Beiträge zur Völker- und Sprachkunde von Deutsch-Neu-Guinea. Ergänzungshft no. 5, der Mitteilungen aus den Deutschen Schutzgebieten. Berlin, 1912.

FRIEDENTHAL, H.

1913. Vergleich von Tasmanierkopfharen mit den Kopfharen anderen Menschenrassen. Zeitschrift für Ethnologie, vol. 45, pp. 49-56. Berlin, 1913.

GARRET, T. R. H.

1912. The natives of the eastern portion of Borneo and of Java. *Journal of the Royal Anthropological Institute*, vol. 42, pp. 53-67. 1912.

GUHA, B. S.

1935. Racial affinities of the peoples of India. *Census of India, 1931*, vol. I — India. Part III — Ethnographical, lxxi and 116 pp. Delhi, 1935.

HADDON, A. C.

1899. The little negroes of the East. (Review of A. B. Meyer's *The Negritos*), *Nature*, no. 1558, vol. 60, pp. 433-434. 1899.
1901. A sketch of the ethnography of Sarawak. *Archivio per l'Antropologia e la Etnologia*, vol. 31, pp. 341-345. Florence, 1901.
1912. The physical characters of the races and peoples of Borneo. Appendix in the *Pagan Tribes of Borneo*, C. Hose and W. McDougall, 2 vols. London, 1912.
1915. Note antropologiche sui Papua occidentali della Nuova Guinea Inglese. *Rivista di Antropologia*, vol. 20, no. 16. Rome, 1915-1916.

HAGEN, B.

1890. Anthropologische Studien aus Insulinde. *Verhandelingen der Koninklijke Akademie van Wetenschappen*, vol. 28, 149 pp. Amsterdam, 1890.
1908. Die Orang Kubu auf Sumatra. *Veröffentlichungen aus dem Städtischen Völker-Museum Frankfurt am Main*. No. 2. Frankfurt, 1908.

HARRIS, R. G.

1926. The San Blas Indians. *American Journal of Physical Anthropology*, vol. IX, no. 1, pp. 17-63.

HELLMAN, M.

1934. The form of the Talgai palate. *American Journal of Physical Anthropology*, vol. 19, no. 1, pp. 1-15. Philadelphia, 1934.

HOLBE, M. T. V.

1923. Somatique extrême-orientale. *Revue Anthropologique*, vol. 33, pp. 217-258. 1923.

HOOTON, E. A.

1931. *Up from the ape*. 351 pp. New York, 1931.

HOWELLS, W. W.

1933. Anthropometry and blood types in Fiji and the Solomon Islands. *Anthropological Papers of the American Museum of Natural History*, vol. 33, part 4. New York, 1933.

HOWITT, A. W.

1904. *The native tribes of south-east Australia*. 819 pp. London, 1904.

92 ANTHROPOMETRY OF THE NATIVES OF ARNHEM LAND

HRDLIČKA, A.

- 1926a. Light hair in Australian aborigines. *American Journal of Physical Anthropology*, vol. 9, no. 1, pp. 137-139. Washington, 1926.
- 1926b. The peopling of the earth. *Proceedings of the American Philosophical Society*, vol. 65, no. 3, pp. 150-156. Philadelphia, 1926.
- 1927-28. Catalogue of human crania in the United States National Museum collections. *Proceedings of the United States National Museum*, vol. 71, no. 24, 140 pp. Washington, 1928.

JONES, F. W., AND CAMPBELL, T. D.

- 1924. Anthropometric and descriptive observations on some South Australian aborigines, with a summary of previously recorded anthropometric data. *Transactions and Proceedings of the Royal Society of South Australia*, vol. 48, pp. 303-312. Adelaide, 1924.

KEITH, A.

- 1925. *The antiquity of man*. 2nd ed., 2 vols. London, 1925.
- 1930. *New discoveries relating to the antiquity of man*. 303 pp. New York, 1930.

KLEIWEG DE ZWAAN, J. P.

- 1914. *Die Insel Nias bei Sumatra. Anthropologische Untersuchungen über die Niasser*. 3 vols. The Hague, 1914.
- 1925. *De rassen van den Indischen Archipel*. 237 pp. Amsterdam, 1925.
- 1929. The anthropology of the Indian Archipelago and its problems. *Science in the Netherlands East Indies*, pp. 192-206, edited by L. M. R. Rutten. Amsterdam, 1929.

KLOSS, C. B.

- 1915. Measurements of some Sakai of Sungkai and Slim, South Perak, with notes on the same. *Journal of the Federated Malay States Museums*, vol. 6, no. 2, pp. 71-85. Singapore, 1915.

KOCH, J. W. R.

- 1907. Beitrag zur Kenntniss der Anthropologie der Bewohner von Niederländisch-Neu-Guinea (Südliche Küste). *Petrus Camper*, vol. 4, p. 202.

KOGANEI, J.

- 1894. Beiträge zur physische Anthropologie der Aino. II Untersuchungen am Lebenden. *Mitteilungen aus der Medicinischen Facultät der Kaiserlich-Japanischen Universität*, vol. 2, pp. 251-403. Tokio, 1894.

KOHLBRUGGE, I. H. F.

- 1898. *L'anthropologie des Tenggerois. Indonesiens-montagnards de Java. L'Anthropologie*, vol. 9, pp. 1-25. Paris, 1898.

LE GROS CLARK, W. E.

1934. Early fore-runners of man. A morphological study of the evolutionary origin of the Primates. 296 pp. London, 1934.

1935. Man's place among the Primates. *Man*, vol. 25, no. 2, January, 1935.

LUBBERS, A. E. H.

1893. Eene bijdrage tot de anthropologie der bevolking in de Assistent-Residentie Gorontalo (Residentie Menado). *Geneeskundig Tijdschrift voor Nederlandsch-Indie*. Uitgegeven door de Vereening tot Bevordering der Geneeskundig Wetenschappen in Nederlandsch-Indie. Vol. 32, pp. 775-806. Batavia, 1893.

LUSCHAN, F. VON, ET AL.

1897. Deutschland und seine Kolonien im Jahre 1896. Amtlicher Bericht über die erste deutsche Kolonial-Ausstellung. 368 pp. Berlin, 1897.

MACCURDY, G. G.

1914. Human skulls from Gazelle Peninsula. *University of Pennsylvania Anthropological Publications*, vol. 6, no. 1, pp. 1-21. Philadelphia, 1914.

MARTIN, R.

1905. Die Inlandstämme der Malayischen Halbinsel. *Wissenschaftlicher Ergebnisse einer Reise durch die Vereinigten Malayischen Staaten*. 1052 pp. Jena, 1905.

MATHEW, J.

1910. Two representative tribes of Queensland. 256 pp. London, 1910.

MJÖBERG, E.

1918. Bland Stenåldsmanniskor i Queenslands vildmarker. 584 pp. Stockholm, 1918.

MONTANDON, G.

1927. Au pays des Aïnou. 240 pp. Paris, 1927.

1928. L'Ologenèse Humaine. 477 pp. Paris, 1928.

MORANT, G. W.

1927. A study of the Australian and Tasmanian skulls based on previously published measurements. *Biometrika*, vol. 19, parts 3 and 4, pp. 417-440. London, 1927.

MOSZKOWSKI, M.

1908. Über zwei nicht-Malayische Stämme von Ost-Sumatra. *Zeitschrift für Ethnologie*, vol. 40, pp. 229-239. Berlin, 1908.

1909. Auf neuen Wegen durch Sumatra. *Forschungsreisen in Ost- und Zentral-Sumatra (1907)*. 328 pp. Berlin, 1909.

NYESSEN, D. J. H.

1929. The races of Java. 122 pp. Weltevreden, 1929.

94 ANTHROPOMETRY OF THE NATIVES OF ARNHEM LAND

PARKINSON, R.

1907. Dreissig Jahre in der Südsee. 876 pp. Stuttgart, 1907.

PÖCH, R.

1915. Studien an Eingeborenen von Neu-süd-wales und an australischen Schädeln. Mitteilungen der anthropologischen Gesellschaft in Wien, vol. 45, pp. 12-108. Vienna, 1915.

RISLEY, H. H.

1891. The tribes and castes of Bengal. Vols. 1 and 2, Anthropometric Data. Calcutta, 1891.

ROBERTSON, A. W. D.

1910. Craniological observations on the lengths, breadths, and heights of a hundred Australian aboriginal crania. Proceedings of the Royal Society of Edinburgh, vol. 31, part 1, pp. 1-16. Edinburgh, 1910.

ROTH, W.

1901-10. North Queensland Ethnography. Bulletins no. 1-18. Published separately or in the Records of the Australian Museum. Brisbane, 1901-1906; Sydney, 1908-1910.

ROY, J. C.

1915. The Oraons of Chota Nagpur: their history, economic life, and social organization. 491 pp. Ranchi, 1915.

SANDE, G. A. J. VAN DER

1907. Ethnography and Anthropology, Nova Guinea, vol. 3. Leiden, 1907.

SARASIN, F.

1906. Versuch einer Anthropologie der Insel Celebes. Zweiter Teil: die Varietäten des Menschen auf Celebes. Materialien zur Naturgeschichte der Insel Celebes V Band II Teil. Weisbaden, 1906.

SARASIN, F., AND ROUX, J.

1922. Anthropologie der Neu-Caledonier und Loyalty-Insulaner. Nova Caledonia, C. Anthropologie, Berlin, 1922.

SARASIN, P., AND SARASIN, F.

1893. Die Weddas von Ceylon und die sie umgebenden Völkerschaften. Ergebnisse naturwissenschaftlicher Forschungen auf Ceylon. Vol. 3, Weisbaden, 1893.

SCHLAGINHAUFEN, O.

1908. Ein Besuch auf den Tanga-Insela. Globus, vol. 94, no. 11, pp. 165-169. Braunschweig, 1908.

1914. Anthropometrische Untersuchungen an Eingeborenen in Deutsch-Neuguinea. Abhandlungen und Berichte des Königl. Zoologischen und Anthropologisch-Ethnographischen Museums zu Dresden, vol. 14, no. 5 (1912). Leipzig, 1914.

SCHMIDT, E.

1910. Beiträge zur Anthropologie Südindiens. Archiv für Anthropologie, Neue Folge, vol. 9, pp. 90-158. Braunschweig, 1910.

SCHOETENSACK, O.

1901. Die Bedeutung Australiens für die Heranbildung des Menschen aus einer niederen Form. Zeitschrift für Ethnologie, vol. 33, pp. 127-154. Berlin, 1901.

SELIGMANN, C. G.

1910. The Melanesians of British New Guinea. 766 pp. Cambridge, 1910.

SELIGMANN, C. G. AND B. Z.

1911. The Veddás. 463 pp. Cambridge, 1911.

SERGI, G.

1913. Tasmaniani e Australiani. Rivista di Antropologia, vol. 18, part 1, pp. 111-163. Rome, 1913.

SKEAT, W. W., AND BLAGDEN, C. O.

1906. Pagan races of the Malay Peninsula. 2 vols. London, 1906.

SMYTH, R. B.

1878. The aborigines of Victoria: with notes relating to the habits of the natives of other parts of Australia and Tasmania. 2 vols. London, 1878.

SOLLAS, W. J.

1911. Ancient hunters and their modern representatives. 416 pp. London, 1911.

SPEISER, F.

1923. Anthropologische Messungen aus den St. Cruz Inseln. Archiv für Anthropologie, Neue Folge, vol. 19, pp. 89-146. Braunschweig, 1923.
1929. Anthropologische Messungen aus Espiritu Santo (Neue Hebriden). Ein Beitrag zur Pygmäenfrage. Verhandlungen der Naturforschenden Gesellschaft in Basel, vol. 39, pp. 79-166. Basel, 1929.

SPENCER, B.

1914. Native tribes of the Northern Territory of Australia. 516 pp. London, 1914.

SPENCER, B., AND GILLEN, F. J.

1899. The native tribes of Central Australia. 671 pp. London, 1899.
1904. The northern tribes of Central Australia. 784 pp. London, 1904.

STIRLING, E. C.

1896. Report on the work of the Horn Scientific Expedition to Central Australia. Part IV, Anthropology. Melbourne, 1896.

96 ANTHROPOMETRY OF THE NATIVES OF ARNHEM LAND

SULLIVAN, L. R.

1918. Racial types in the Philippine Islands. *Anthropological Papers of the American Museum of Natural History*, vol. 23, part 1. New York, 1918.

TAYLOR, G.

1928. Variation among the Australian aborigines, with special reference to tawny hair. *Proceedings of the Third Pan-Pacific Science Congress*, vol. 2, pp. 2386-2389. Tokyo, 1928.

TAYLOR, G., AND JARDINE, F.

1924. Kamilaroi and White. *Journal and Proceedings of the Royal Society of New South Wales*, vol. 58, pp. 268-294. Sydney, 1924.

TEN KATE, H.

1915. *Mélanges anthropologiques. III. Indigènes de l'archipel Timorien. L'Anthropologie*, vol. 26, pp. 519-564. Paris, 1915.

THURSTON, E.

- 1897, 1899. *Anthropology. Madras Government Museum Bulletin*, vol. 2, nos. 1 and 3. Madras, 1897, 1899.
1909. *Castes and tribes of Southern India. Vol. 1*, 397 pp. Madras, 1909.

TOPINARD, P.

1872. *Étude sur les races indigènes de l'Australie. Bulletins de la Société d'Anthropologie de Paris. 2nd series*, vol. 7, pp. 211-327. Paris, 1872.
1877. *L'Anthropologie. 2nd ed.*, 560 pp. Paris, 1877.

TURNER, W.

1884. Report on the human crania and other bones of the skeletons collected during the voyage of H. M. S. Challenger, in the years 1873-1876. Part I—The crania. Report on the scientific results of the voyage of H. M. S. Challenger, during the years 1873-1876. Vol. X, part IV, 130 pp. London, 1884.
1908. The craniology, racial affinities, and descent of the aborigines of Tasmania. *Transactions of the Royal Society of Edinburgh*, vol. 46, part 2, pp. 365-403. Edinburgh, 1908.

VOLZ, W.

1909. Beiträge zur Anthropologie und Ethnographie von Indonesien. III Zur Kenntnis der Kubus von Südsumatra. *Archiv für Anthropologie, Neue Folge*, vol. 7, pp. 89-109. Braunschweig, 1909.

WARNER, W. L.

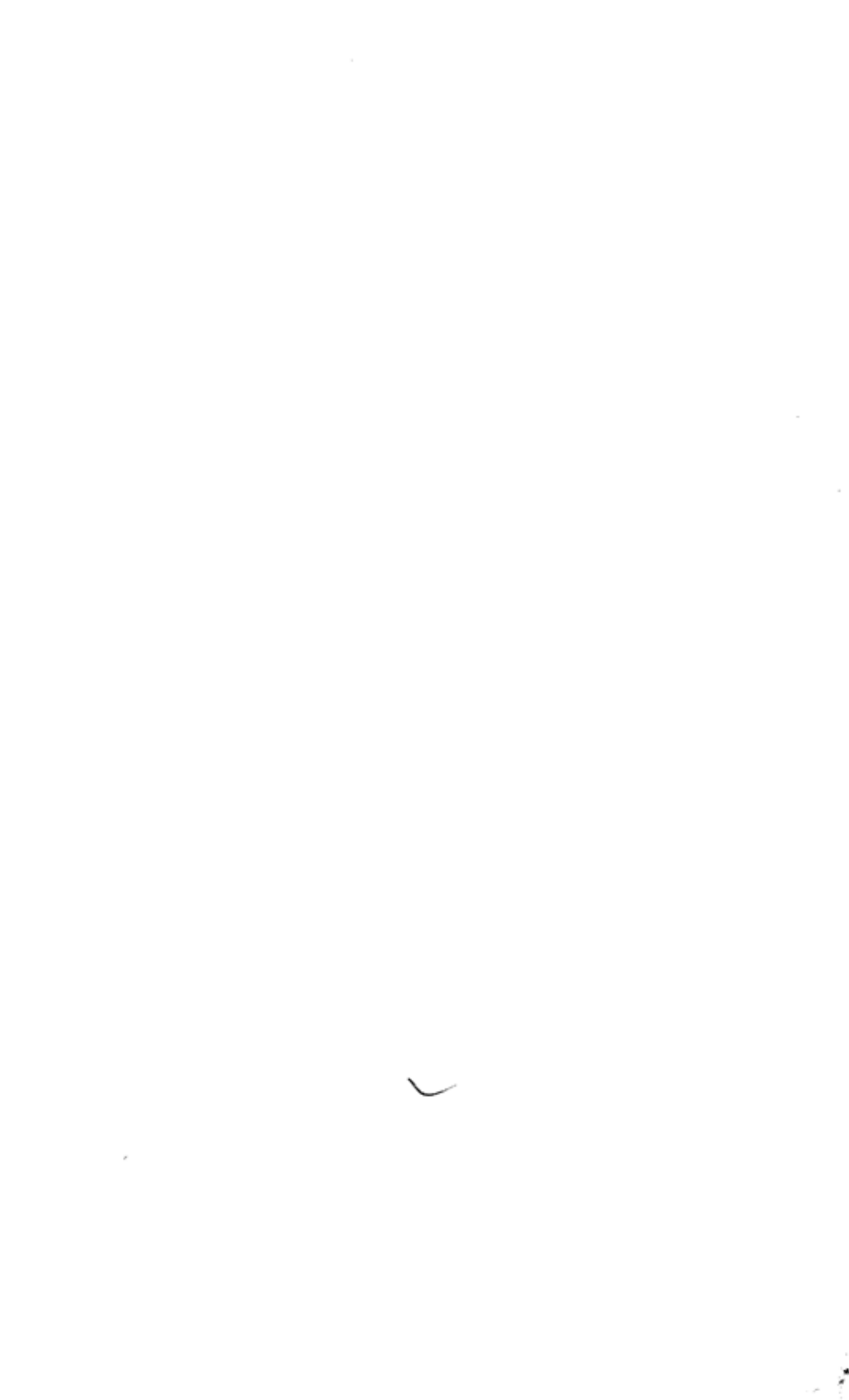
1933. The kinship morphology of forty-one Northern Australian tribes. *American Anthropologist*, vol. 35, no. 1, pp. 63-86. 1933.

WIRZ, P.

- 1924. Anthropologische und Ethnologische Ergebnisse der Central Neu-Guinea Expedition, 1921-1922. Nova Guinea, vol. 16, pp. 1-147. Leiden, 1924.
- 1925. Zur Anthropologie der Biaker, Nuforesen und der Bewohner des Hinterlandes der Doreh-Bai. Archiv für Anthropologie, Neue Folge, vol. 20, pp. 185-215. Braunschweig, 1925.

WOLLASTON, A. F. R.

- 1912. Pygmies and Papuans. 352 pp. New York, 1912.



VOLUME IV (Continued)

- No. 3. The Animal Figures in the Maya Codices. By A. M. Tozzer and G. M. Allen.
1910. 100 pages, 39 plates, and 24 illustrations in the text. \$1.75.

VOLUME V, \$5.75; bound in cloth, \$6.25.

- The Archaeology of the Delaware Valley. By Ernest Volk.
1911. 258 pages, 2 maps, 125 plates, and 26 illustrations in the text.

VOLUME V

- No. 1. Com. E. Gates.

No. 2. A Po the Dres-
CENTRAL ARCHAEOLOGICAL LIBRARY
NEW DELHI

No. 3. Astr son.
Issue Record.

No. 4. The Catalogue No. 513.60994/How/War.-
2530.

VOLUME Author—Howells, W.W. and Warner, By Philip
His W.L.

VOLUME Title—Anthropometry of the nati-
ves of Arnhem land and the By E. A.
No. 1. Inc Australian race problem.

Borrower No.	Date of Issue	Date of Return

No. 2. nsey and
"A book that is shut is but a block"

No. 3. By C. C.

VOLUME GOVT. OF INDIA
Department of Archaeology
NEW DELHI. th an Ap-

VOLUME

Please help us to keep the book
clean and moving.

VOLUME illoughby.
No. 1. S. B., 148. N. DELHI.

- No. 2. Official Reports on the towns of Tequizistlan, Tepechpan, Acolman, and San Juan Teotihuacan, sent by Francisco de Castañeda to His Majesty, Philip II, and the Council of the Indies in 1580.
1926. 45 pages, 2 plates, and 2 illustrations in the text. 35 cents.
Translated and edited, with an introduction and notes, by Zelia Nuttall.